US010713928B1

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Gerstberger et al.

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(45) **Date of Patent: Jul. 14, 2020**

(54) **ARMING SECURITY SYSTEMS BASED ON COMMUNICATIONS AMONG A NETWORK OF SECURITY SYSTEMS**

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(73) Assignee: **Amazon Technologies, Inc.**, Seattle, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/101,440**

(22) Filed: **Aug. 11, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/544,240, filed on Aug. 11, 2017.

(51) **Int. Cl.**

G08B 27/00	(2006.01)
G08B 25/00	(2006.01)
G08B 19/00	(2006.01)
G08B 13/196	(2006.01)

(52) **U.S. Cl.**
CPC ***G08B 25/008*** (2013.01); ***G08B 13/19639*** (2013.01); ***G08B 19/005*** (2013.01); ***G08B 27/003*** (2013.01); *G08B 25/006* (2013.01)

(58) **Field of Classification Search**
CPC G08B 3/10; G08B 13/19695; G08B 13/19656; G08B 25/001; G08B 25/002; G08B 25/003; G08B 25/14; G08B 25/006; G08B 25/008; G08B 19/00; G08B 27/003; H04L 12/2803
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,764,953	A	8/1988	Chern et al.
5,428,388	A	6/1995	von Bauer et al.
5,760,848	A	6/1998	Cho
6,072,402	A	6/2000	Kniffin et al.
6,192,257	B1	2/2001	Ray

(Continued)

FOREIGN PATENT DOCUMENTS

CN	2585521	Y	11/2003
CN	2792061	Y	6/2006

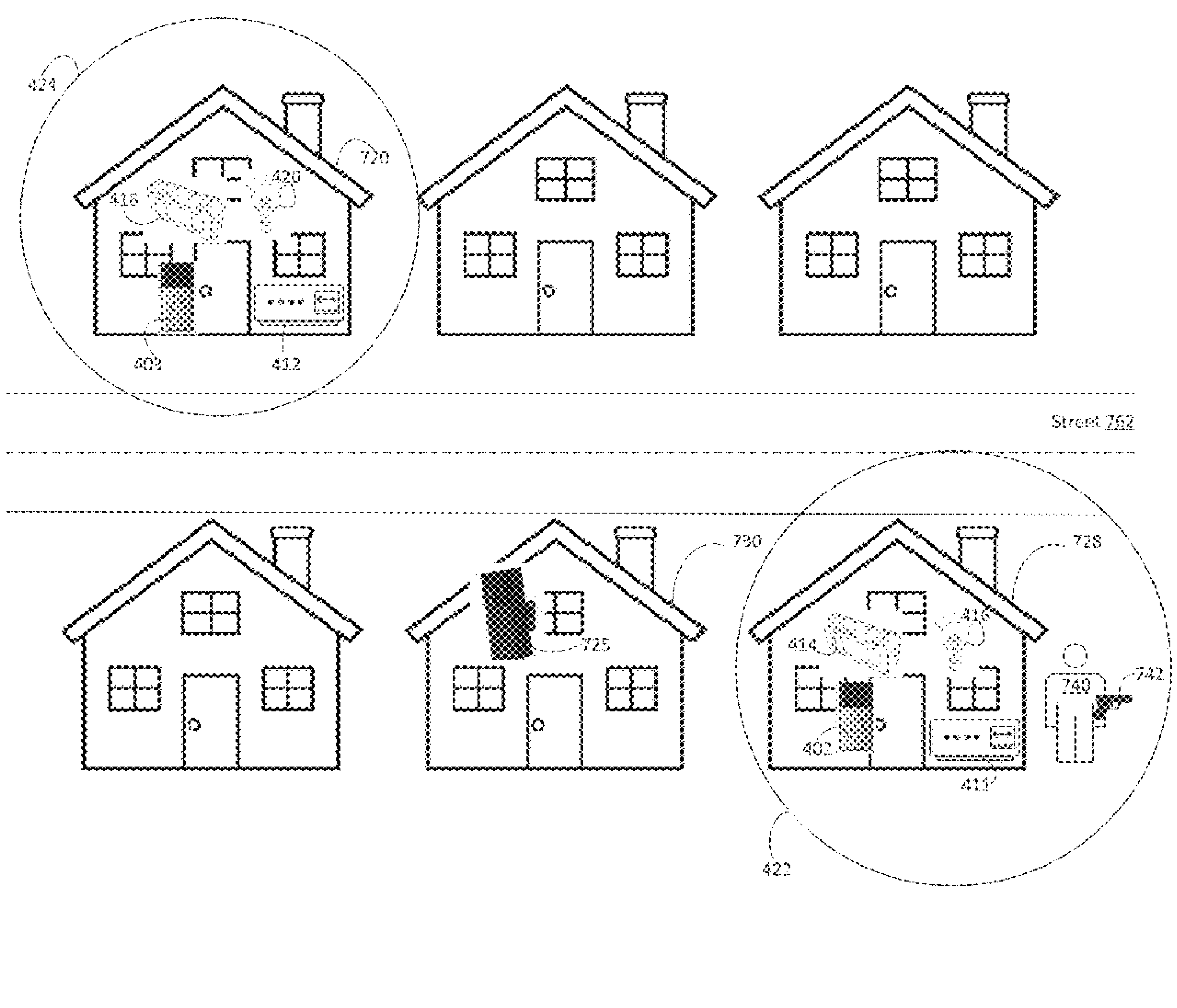
(Continued)

Primary Examiner — Benyam Haile
(74) *Attorney, Agent, or Firm* — Lathrop GPM LLP

(57) **ABSTRACT**

Arming security systems based on communications among a network of security systems in accordance with various embodiments of the present disclosure are provided. In one embodiment, a method for a client device associated with a first security system of a security network is provided, the security network including the first security system installed at a first address and a second security system installed at a second address, the client device including a processor, a communication module, and a display, the method comprising: in response to a security event detected by the second security system at the second address, receiving a user alert; in response to receiving the user alert, displaying the user alert; receiving an input including an arming action for the first security system; and in response to receiving the input, transmitting the arming action to the first security system.

30 Claims, 19 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

6,271,752	B1	8/2001	Vaios
6,429,893	B1	8/2002	Xin
6,456,322	B1	9/2002	Marinacci
6,476,858	B1	11/2002	Ramirez Diaz et al.
6,633,231	B1	10/2003	Okamoto et al.
6,658,091	B1	12/2003	Naidoo et al.
6,753,774	B2	6/2004	Pan et al.
6,970,183	B1	11/2005	Monroe
7,062,291	B2	6/2006	Ryley et al.
7,065,196	B2	6/2006	Lee
7,085,361	B2	8/2006	Thomas
7,109,860	B2	9/2006	Wang
7,113,090	B1 *	9/2006	Saylor G08B 13/19682 340/5.33
7,193,644	B2	3/2007	Carter
7,304,572	B2	12/2007	Sheynman et al.
7,382,249	B2	6/2008	Fancella
7,450,638	B2	11/2008	Iwamura
7,643,056	B2	1/2010	Silsby
7,683,924	B2	3/2010	Oh et al.
7,683,929	B2	3/2010	Elazar et al.
7,738,917	B2	6/2010	Ryley et al.
8,139,098	B2	3/2012	Carter
8,144,183	B2	3/2012	Carter
8,154,581	B2	4/2012	Carter
8,619,136	B2	12/2013	Howarter et al.
8,872,915	B1	5/2014	Scalisi et al.
8,780,201	B1	7/2014	Scalisi et al.
8,823,795	B1	9/2014	Scalisi et al.
8,842,180	B1	9/2014	Kasmir et al.
8,937,659	B1	1/2015	Scalisi et al.
8,941,736	B1	1/2015	Scalisi
8,947,530	B1	2/2015	Scalisi
8,953,040	B1	2/2015	Scalisi et al.
9,013,575	B2	4/2015	Scalisi
9,049,352	B2	6/2015	Scalisi et al.
9,053,622	B2	6/2015	Scalisi
9,058,738	B1	6/2015	Scalisi
9,060,103	B2	6/2015	Scalisi
9,060,104	B2	6/2015	Scalisi
9,065,987	B2	6/2015	Scalisi
9,094,584	B2	7/2015	Scalisi et al.
9,113,051	B1	8/2015	Scalisi
9,113,052	B1	8/2015	Scalisi et al.
9,118,819	B1	8/2015	Scalisi et al.
9,142,214	B2	9/2015	Scalisi
9,160,987	B1	10/2015	Kasmir et al.
9,165,444	B2	10/2015	Scalisi
9,172,920	B1	10/2015	Kasmir et al.
9,172,921	B1	10/2015	Scalisi et al.
9,172,922	B1	10/2015	Kasmir et al.
9,179,107	B1	11/2015	Scalisi
9,179,108	B1	11/2015	Scalisi
9,179,109	B1	11/2015	Kasmir et al.
9,196,133	B2	11/2015	Scalisi et al.
9,197,867	B1	11/2015	Scalisi et al.
9,230,424	B1	1/2016	Scalisi et al.
9,237,318	B2	1/2016	Kasmir et al.
9,247,219	B2	1/2016	Kasmir et al.
9,253,455	B1	2/2016	Harrison et al.
9,342,936	B2	5/2016	Scalisi
9,508,239	B1	11/2016	Harrison et al.
9,736,284	B2	8/2017	Scalisi et al.
9,743,049	B2	8/2017	Scalisi et al.
9,769,435	B2	9/2017	Scalisi et al.
9,786,133	B2	10/2017	Harrison et al.
9,799,183	B2	10/2017	Harrison et al.
2002/0094111	A1	7/2002	Puchek et al.
2002/0147982	A1	10/2002	Naidoo et al.
2003/0043047	A1	3/2003	Braun
2004/0085205	A1	5/2004	Yeh
2004/0085450	A1	5/2004	Stuart
2004/0086093	A1	5/2004	Schranz
2004/0095254	A1	5/2004	Maruszczak
2004/0135686	A1	7/2004	Parker
2005/0111660	A1	5/2005	Hosoda
2006/0010199	A1	1/2006	Brailean et al.
2006/0022816	A1	2/2006	Yukawa
2006/0139449	A1	6/2006	Cheng et al.
2006/0156361	A1	7/2006	Wang et al.
2007/0008081	A1	1/2007	Tylicki et al.
2010/0225455	A1	9/2010	Claiborne et al.
2013/0057695	A1	3/2013	Huisking
2014/0267716	A1	9/2014	Child et al.
2015/0163463	A1	6/2015	Hwang et al.
2017/0213447	A1 *	7/2017	Horrocks G08B 19/00

FOREIGN PATENT DOCUMENTS

EP	0944883	A1	6/1998
EP	1480462	A1	11/2004
GB	2286283	A	8/1995
GB	2354394	A	3/2001
GB	2357387	A	6/2001
GB	2400958	A	10/2004
JP	2001-103463	A	4/2001
JP	2002-033839	A	1/2002
JP	2002-125059	A	4/2002
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JP	2002-344640	A	11/2002
JP	2002-354137	A	12/2002
JP	2002-368890	A	12/2002
JP	2003-283696	A	10/2003
JP	2004-128835	A	4/2004
JP	2005-341040	A	12/2005
JP	2006-147650	A	6/2006
JP	2006-262342	A	9/2006
JP	2009-008925	A	1/2009
WO	1998/39894	A1	9/1998
WO	2001/13638	A1	2/2001
WO	2001/93220	A1	12/2001
WO	2002/085019	A1	10/2002
WO	2003/028375	A1	4/2003
WO	2003/096696	A1	11/2003
WO	2006/038760	A1	4/2006
WO	2006/067782	A1	6/2006
WO	2007/125143	A1	8/2007

* cited by examiner

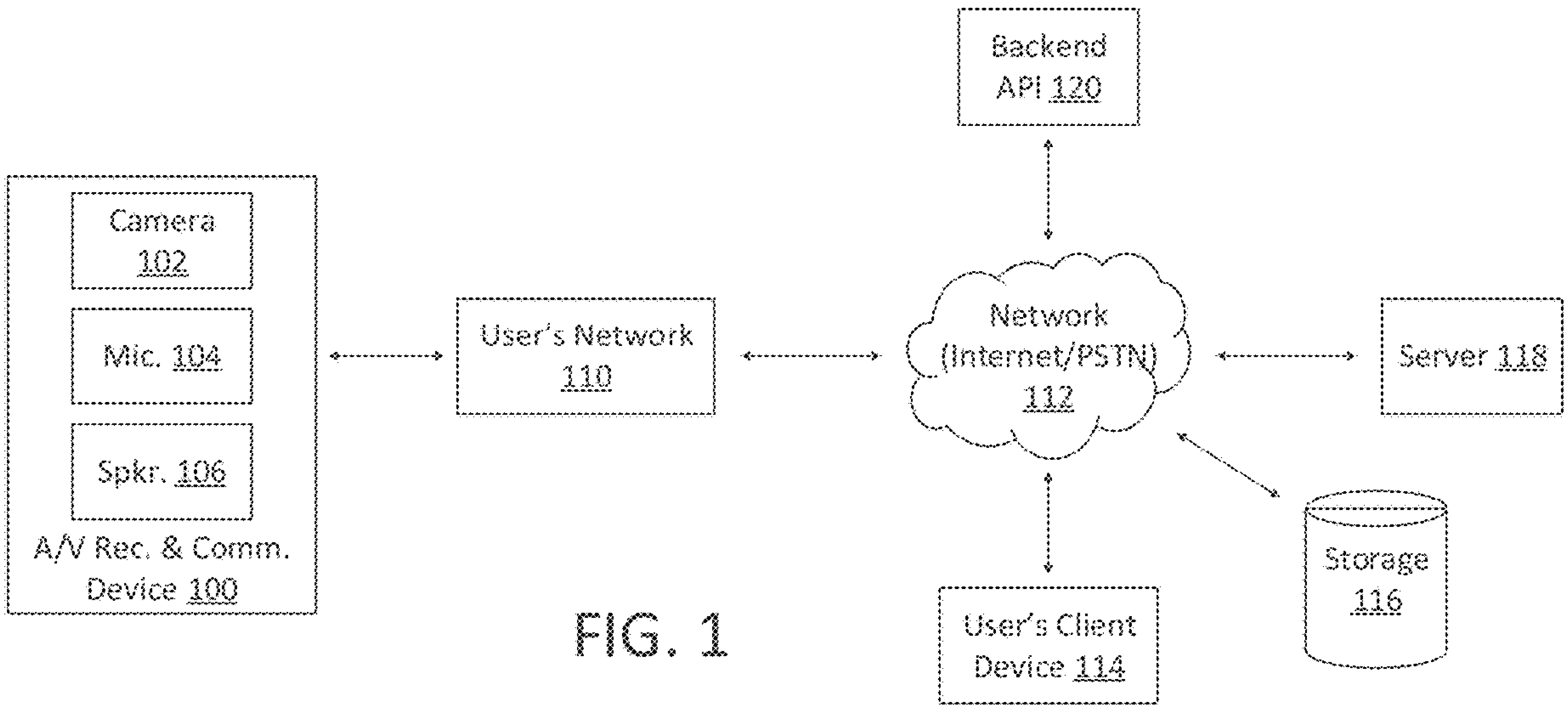

Backend API 120
Camera 102
Mic. 104
Spkr. 106
A/V Rec. & Comm. Device 100
User's Network 110
Network (Internet/PSTN) 112
Server 118
Storage 116
User's Client Device 114

FIG. 1

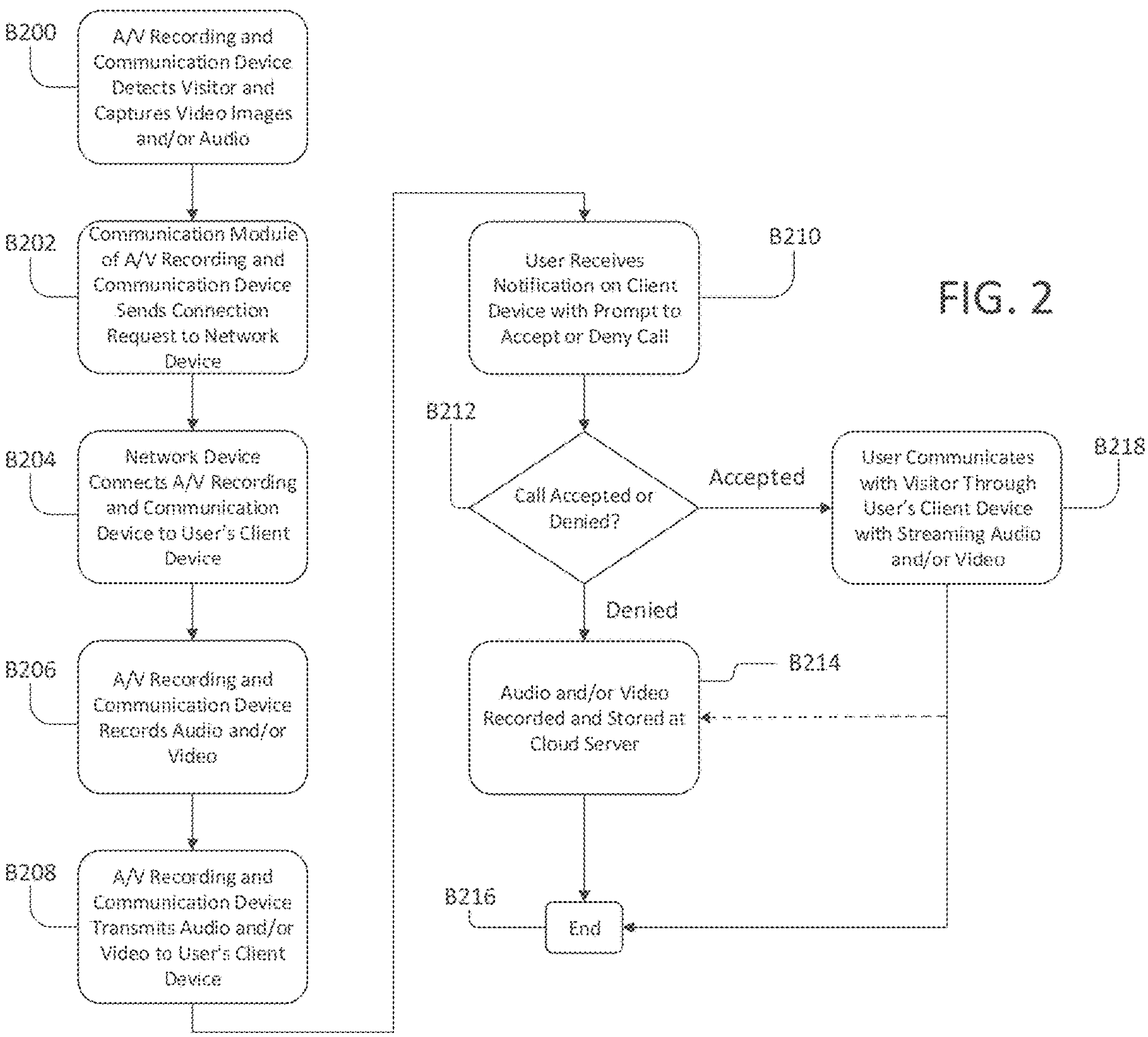

B200
A/V Recording and Communication Device Detects Visitor and Captures Video Images and/or Audio
B202
Communication Module of A/V Recording and Communication Device Sends Connection Request to Network Device
B204
Network Device Connects A/V Recording and Communication Device to User's Client Device
B206
A/V Recording and Communication Device Records Audio and/or Video
B208
A/V Recording and Communication Device Transmits Audio and/or Video to User's Client Device
B210
User Receives Notification on Client Device with Prompt to Accept or Deny Call
B212
Call Accepted or Denied?
Accepted
B218
User Communicates with Visitor Through User's Client Device with Streaming Audio and/or Video
Denied
B214
Audio and/or Video Recorded and Stored at Cloud Server
B216
End

FIG. 2

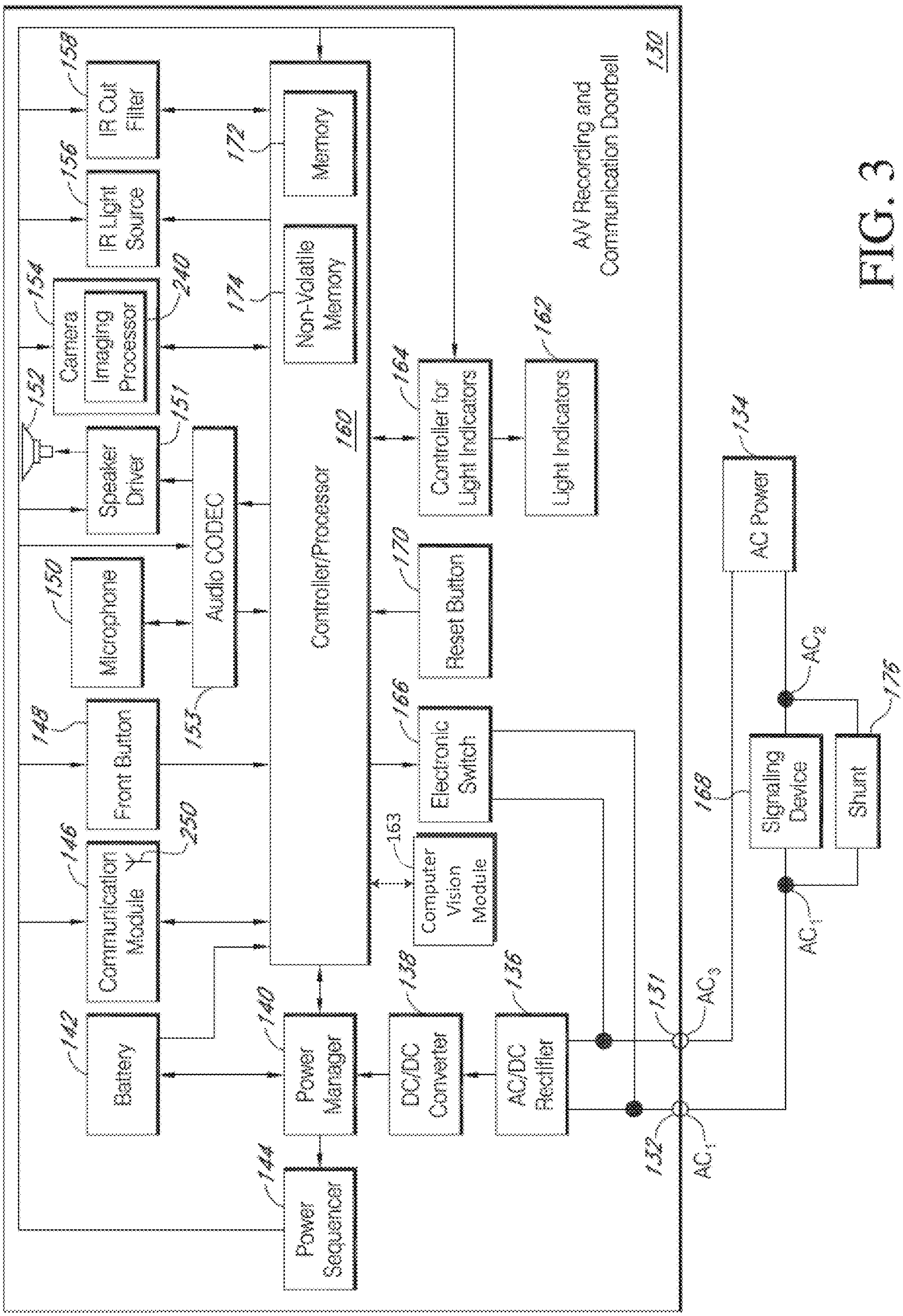

IR Cut Filter
158
IR Light Source
156
Camera
154
Imaging Processor
240
Speaker Driver
152
151
Microphone
150
Audio CODEC
153
Front Button
148
Communication Module
146
250
Battery
142
Power Manager
140
Power Sequencer
144
Memory
172
Non-Volatile Memory
174
Controller/Processor
160
Controller for Light Indicators
164
Light Indicators
162
Reset Button
170
Electronic Switch
166
Computer Vision Module
163
DC/DC Converter
138
AC/DC Rectifier
136
A/V Recording and Communication Doorbell
130
AC Power
134
Signaling Device
168
Shunt
176
AC₂
AC₁
AC₃
131
132

FIG. 3

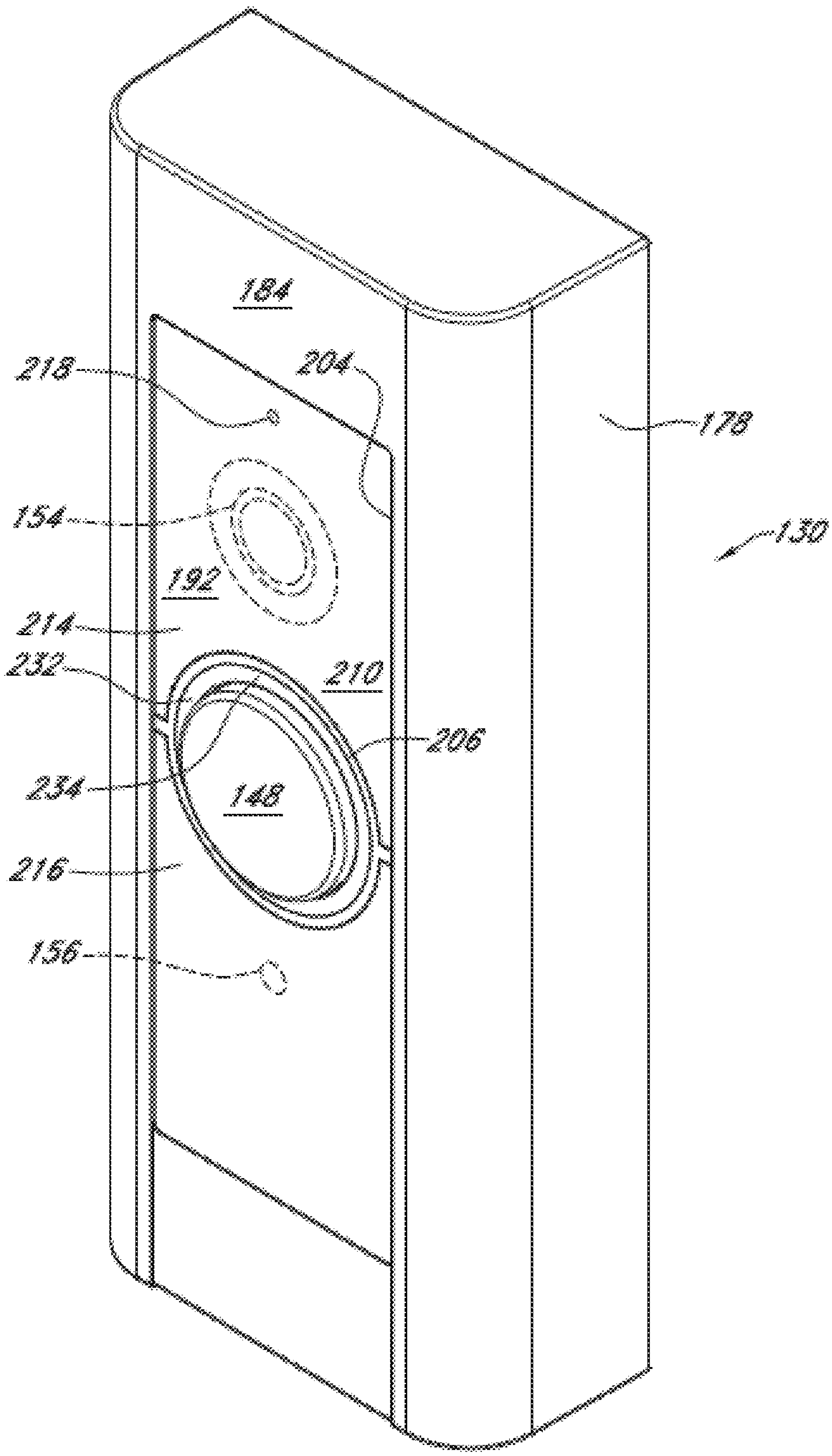


FIG. 4

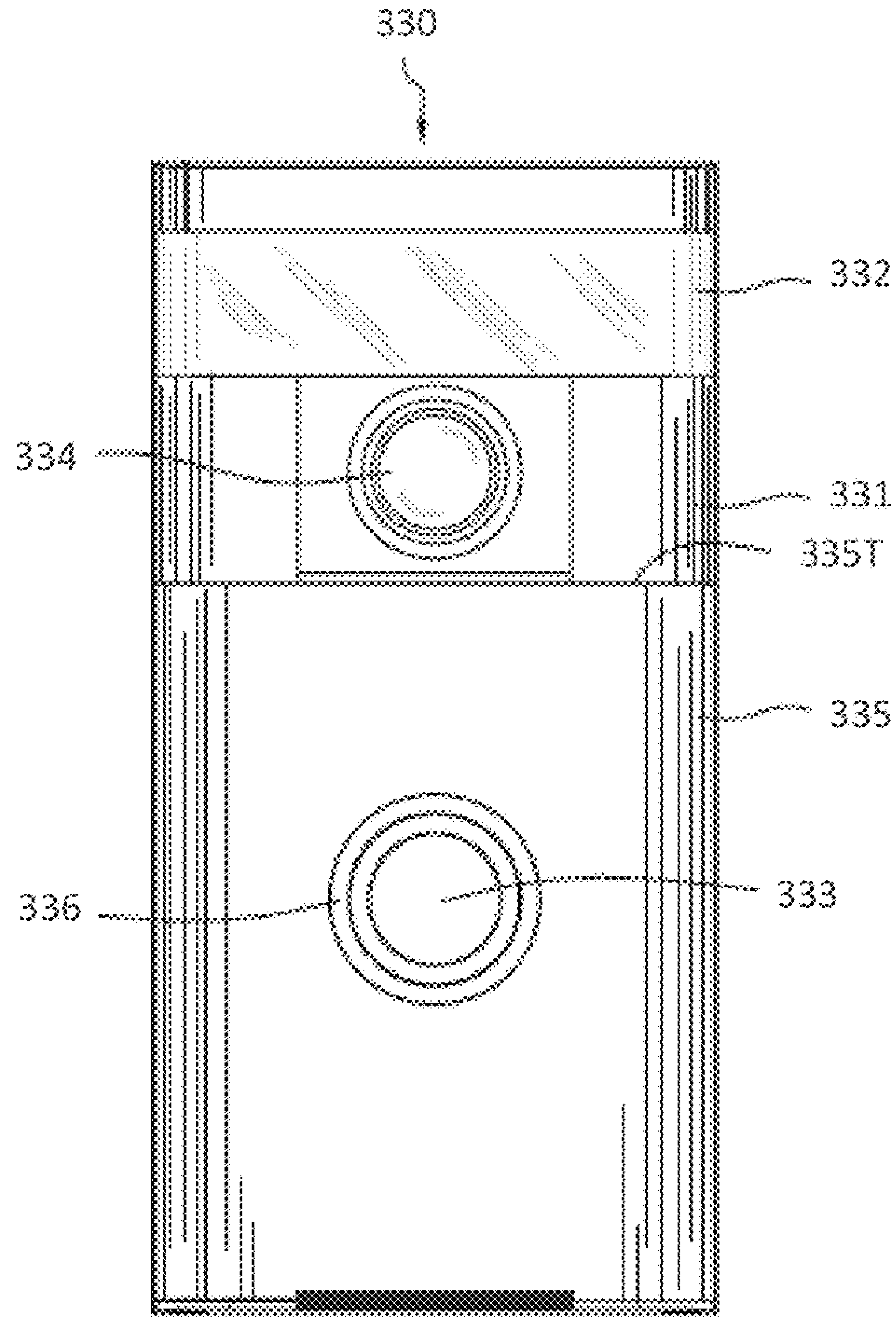


Figure 5

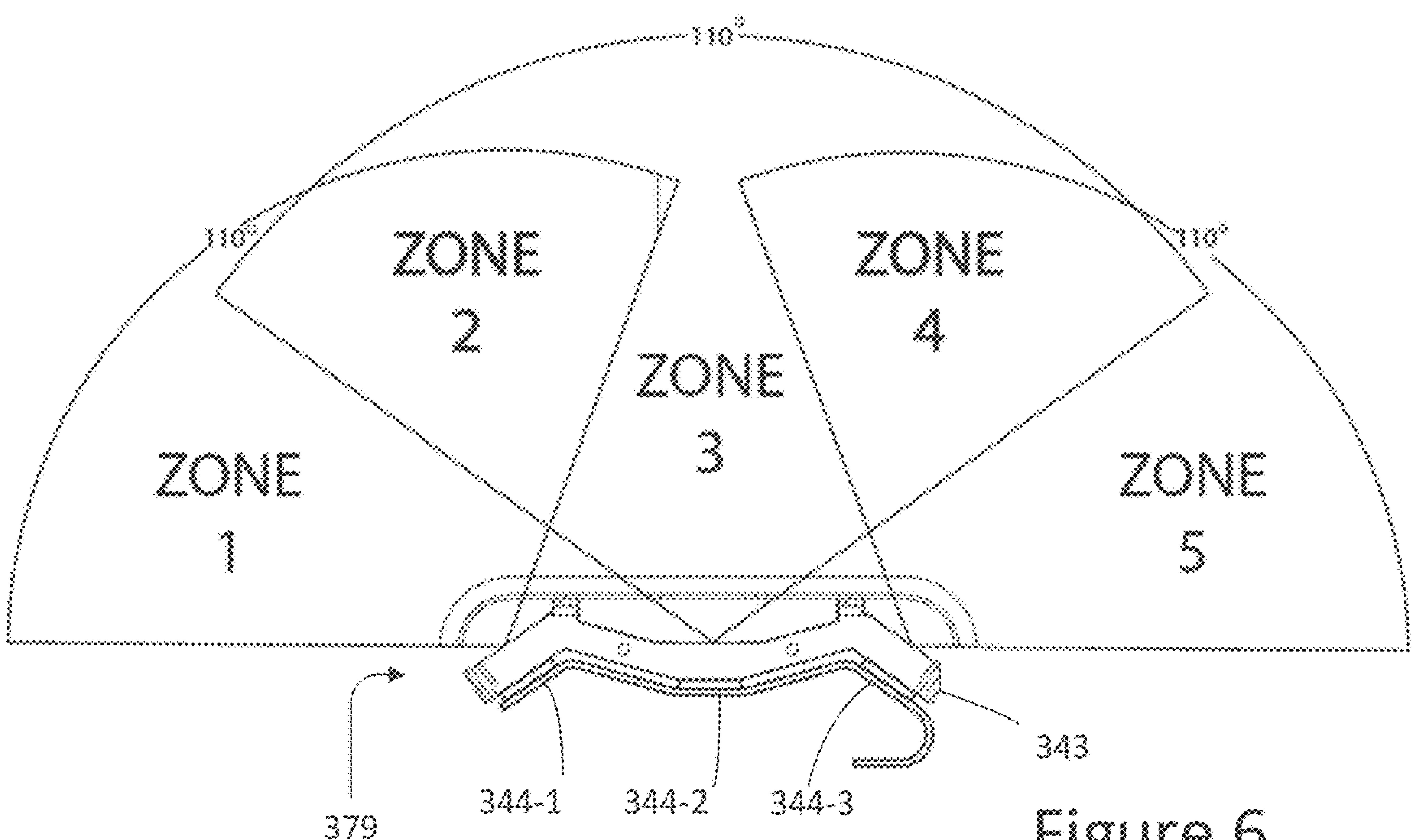


Figure 6

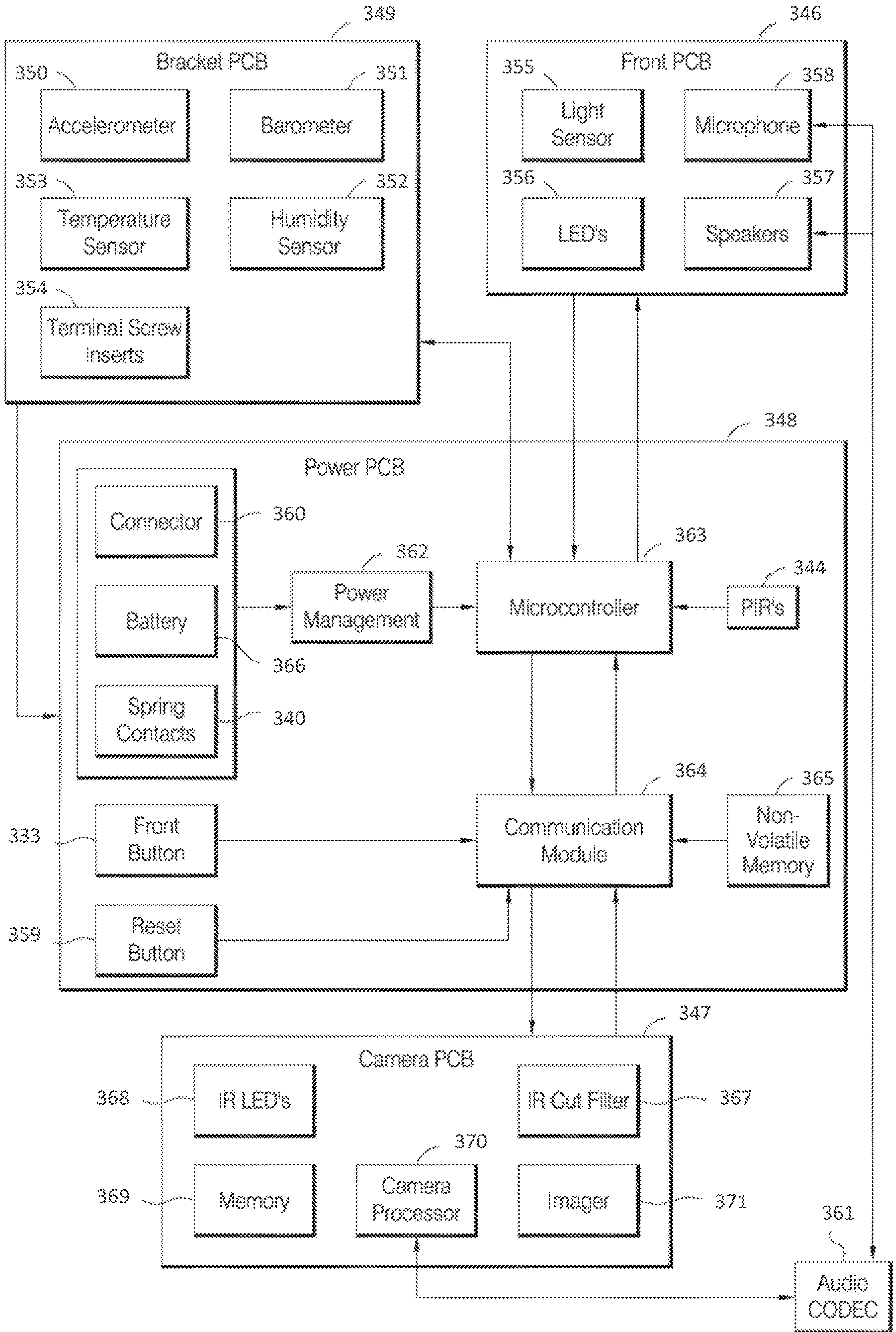

349
Bracket PCB
350
Accelerometer
351
Barometer
353
Temperature Sensor
352
Humidity Sensor
354
Terminal Screw Inserts
346
Front PCB
355
Light Sensor
358
Microphone
356
LED's
357
Speakers
348
Power PCB
Connector
360
Battery
366
Spring Contacts
340
362
Power Management
363
Microcontroller
344
PIR's
364
Communication Module
365
Non-Volatile Memory
333
Front Button
359
Reset Button
347
Camera PCB
368
IR LED's
IR Cut Filter
367
370
369
Memory
Camera Processor
Imager
371
361
Audio CODEC

Figure 7

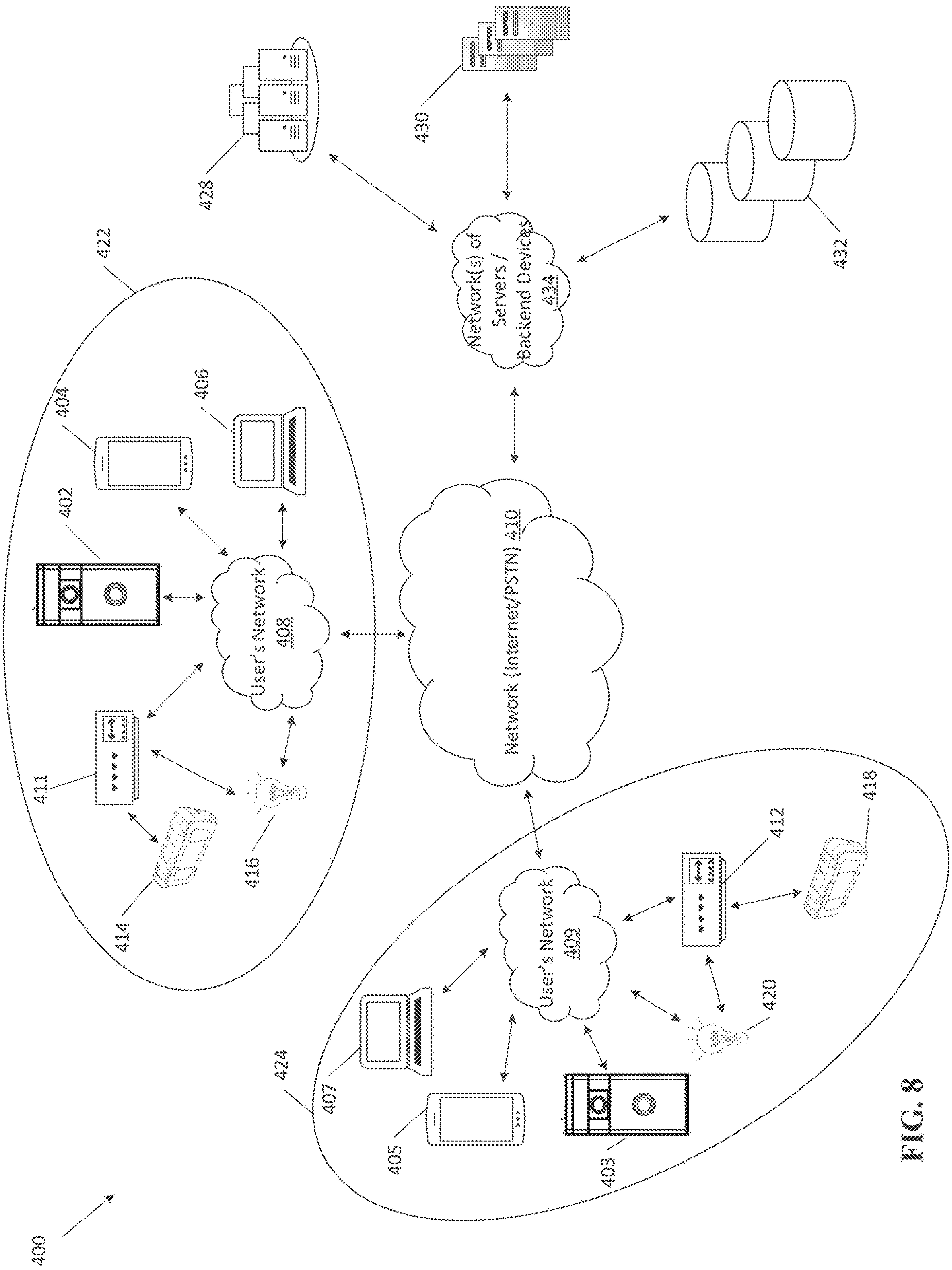

400
422
402
404
406
User's Network 408
411
414
416
Network (Internet/PSTN) 410
Network(s) of Servers / Backend Devices 434
428
430
432
424
User's Network 409
403
405
407
412
418
420

FIG. 8

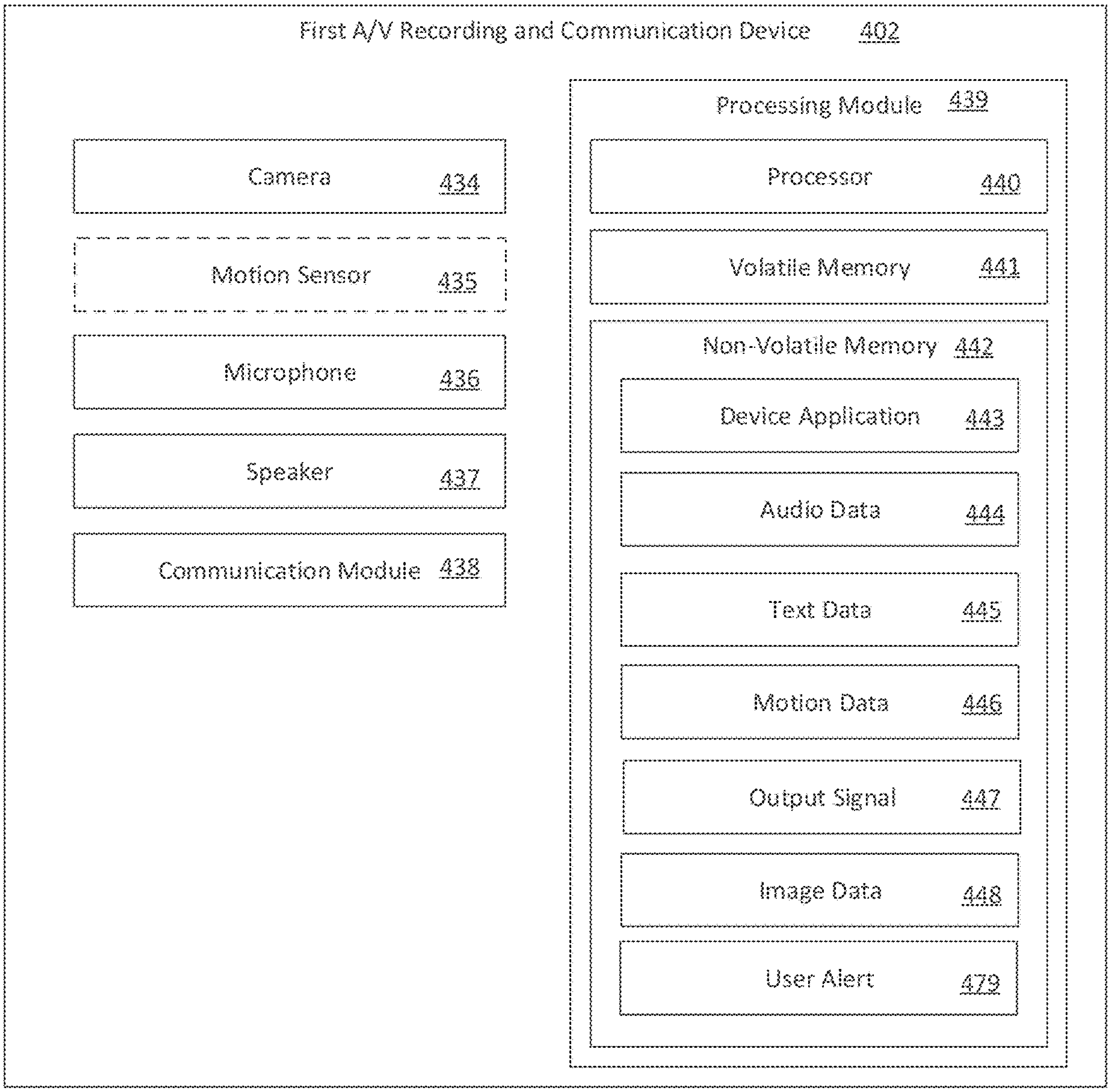

First A/V Recording and Communication Device 402
Camera 434
Motion Sensor 435
Microphone 436
Speaker 437
Communication Module 438
Processing Module 439
Processor 440
Volatile Memory 441
Non-Volatile Memory 442
Device Application 443
Audio Data 444
Text Data 445
Motion Data 446
Output Signal 447
Image Data 448
User Alert 479

FIG. 9

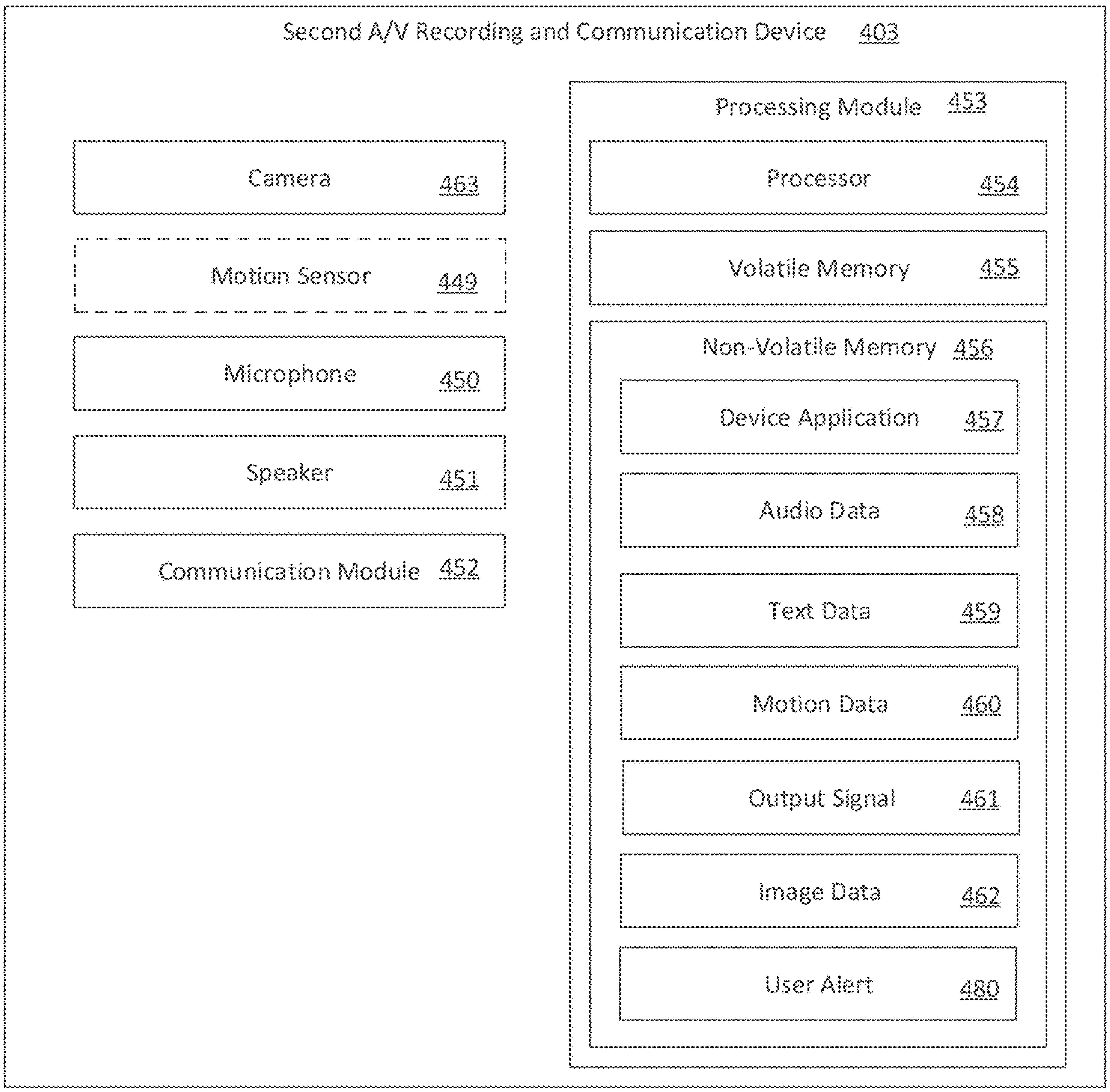

Second A/V Recording and Communication Device 403
Camera 463
Motion Sensor 449
Microphone 450
Speaker 451
Communication Module 452
Processing Module 453
Processor 454
Volatile Memory 455
Non-Volatile Memory 456
Device Application 457
Audio Data 458
Text Data 459
Motion Data 460
Output Signal 461
Image Data 462
User Alert 480

FIG. 10

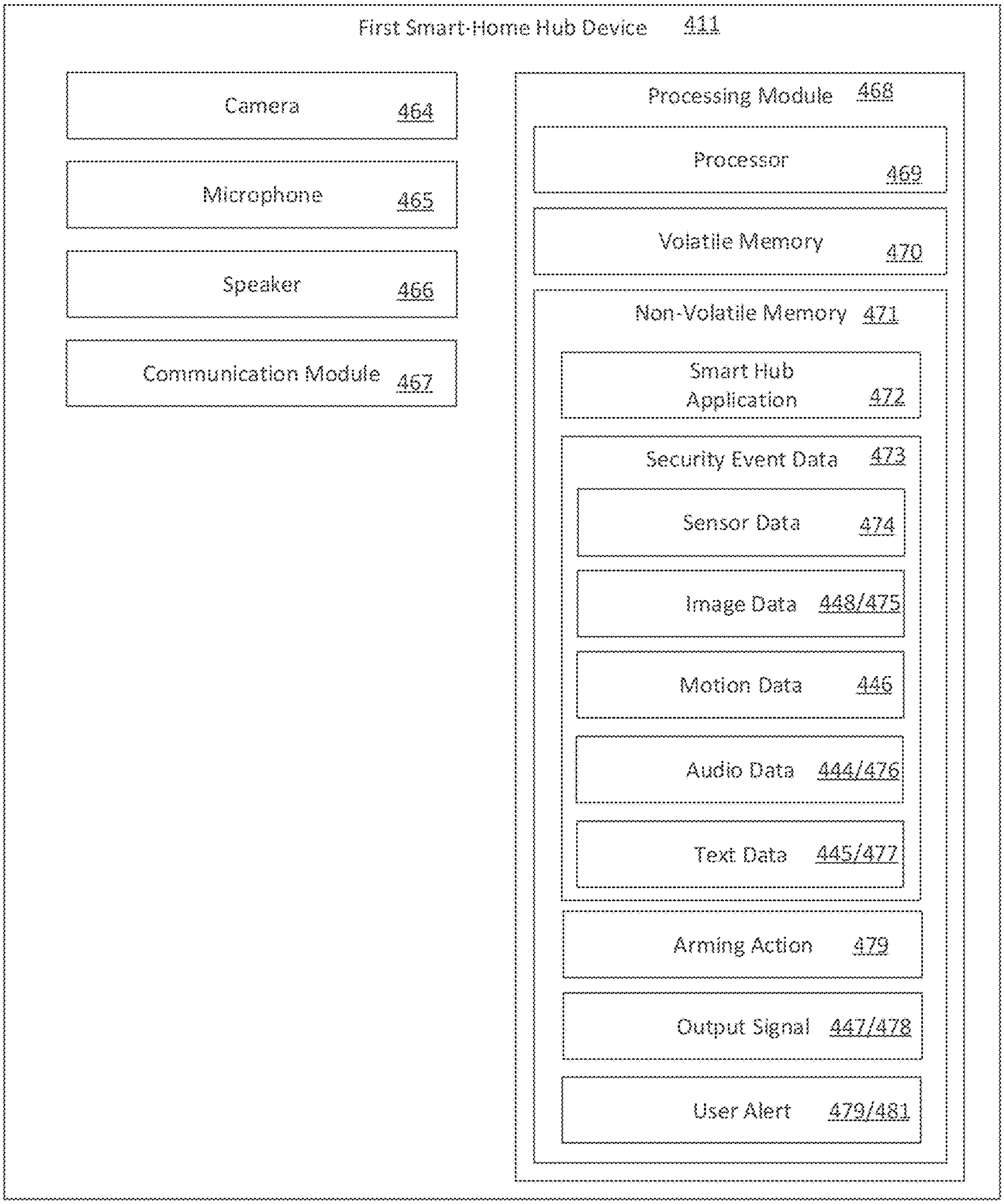

First Smart-Home Hub Device 411
Camera 464
Microphone 465
Speaker 466
Communication Module 467
Processing Module 468
Processor 469
Volatile Memory 470
Non-Volatile Memory 471
Smart Hub Application 472
Security Event Data 473
Sensor Data 474
Image Data 448/475
Motion Data 446
Audio Data 444/476
Text Data 445/477
Arming Action 479
Output Signal 447/478
User Alert 479/481

FIG. 11

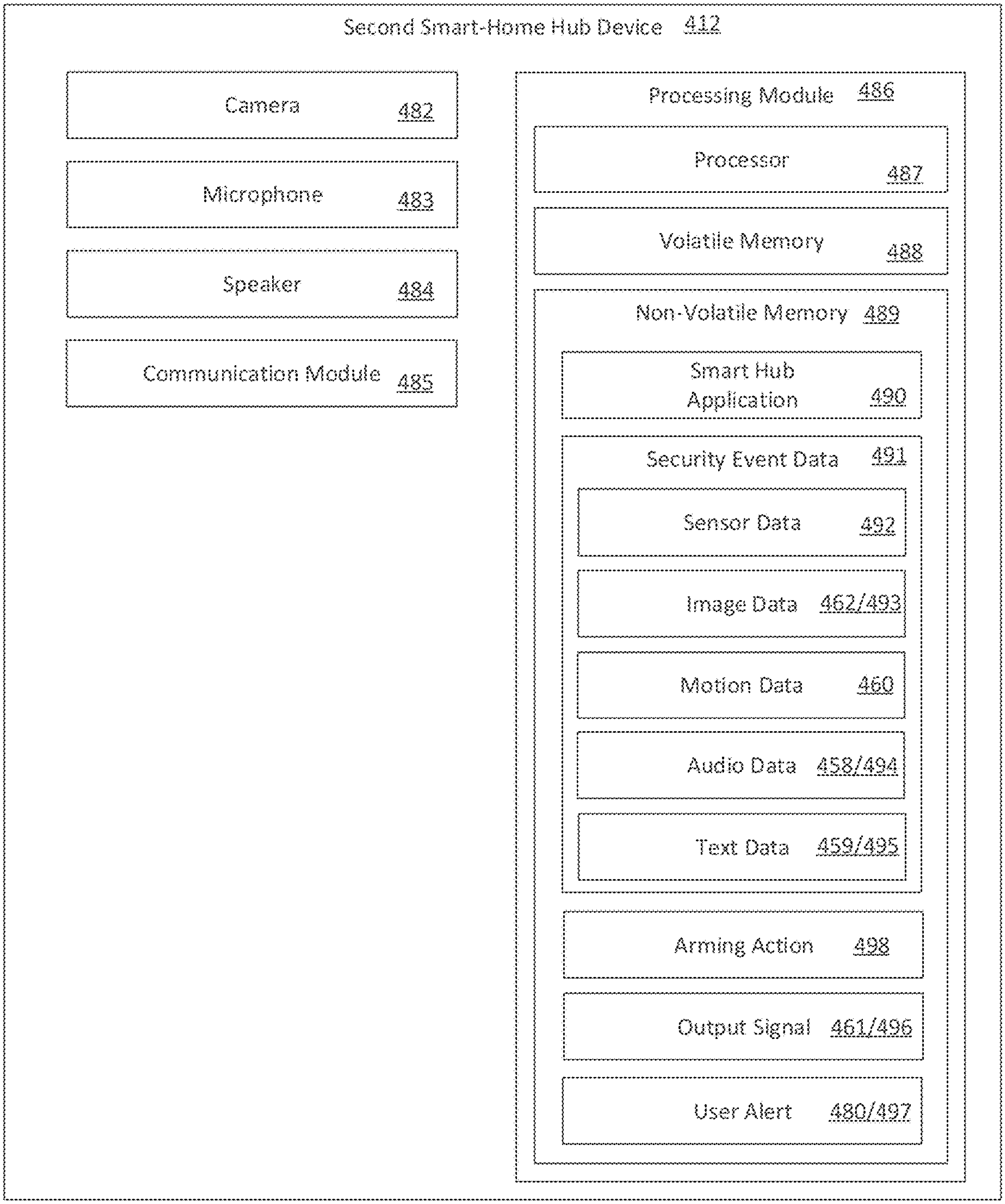

Second Smart-Home Hub Device 412
Camera 482
Microphone 483
Speaker 484
Communication Module 485
Processing Module 486
Processor 487
Volatile Memory 488
Non-Volatile Memory 489
Smart Hub Application 490
Security Event Data 491
Sensor Data 492
Image Data 462/493
Motion Data 460
Audio Data 458/494
Text Data 459/495
Arming Action 498
Output Signal 461/496
User Alert 480/497

FIG. 12

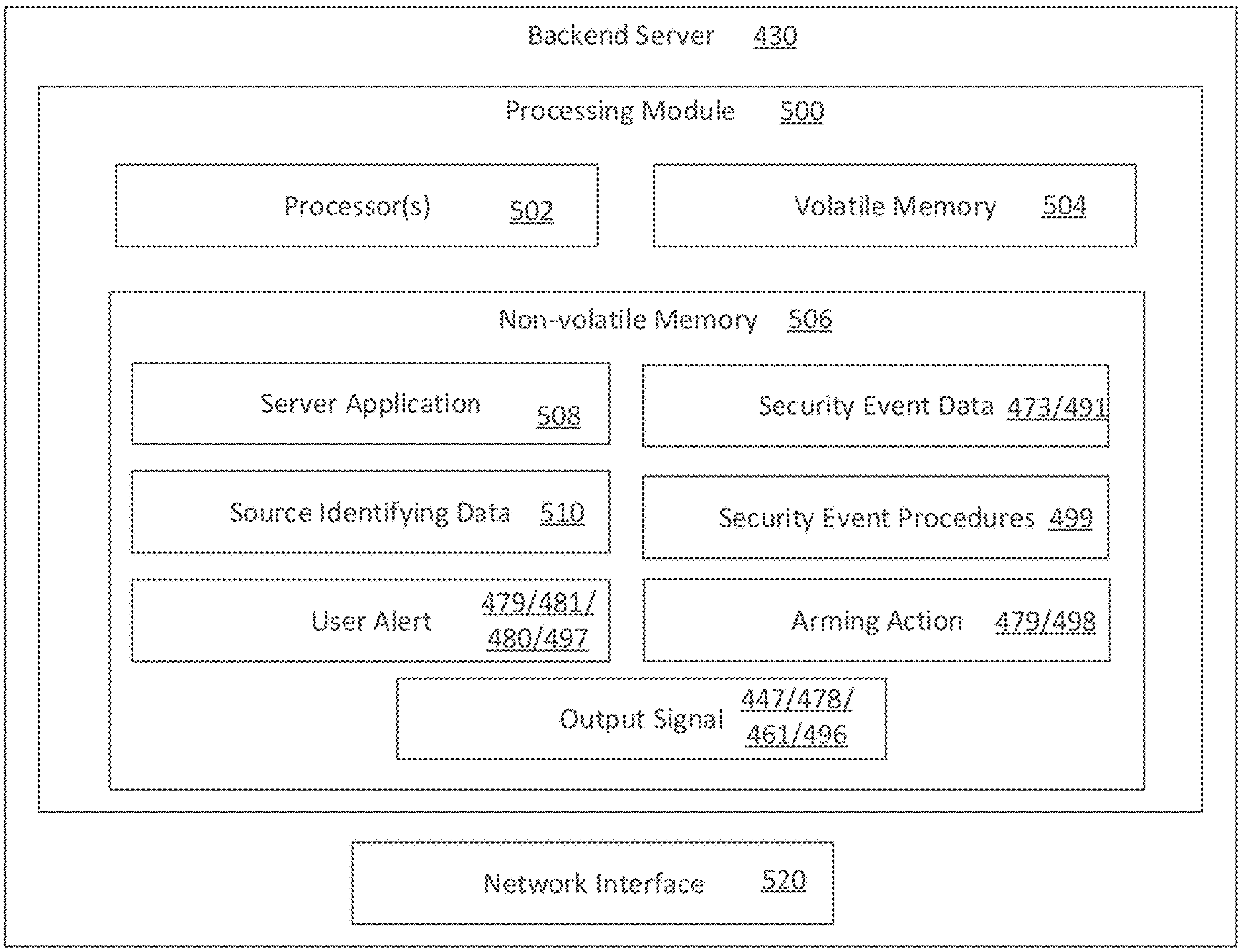

Backend Server 430
Processing Module 500
Processor(s) 502
Volatile Memory 504
Non-volatile Memory 506
Server Application 508
Security Event Data 473/491
Source Identifying Data 510
Security Event Procedures 499
User Alert 479/481/ 480/497
Arming Action 479/498
Output Signal 447/478/ 461/496
Network Interface 520

FIG. 13

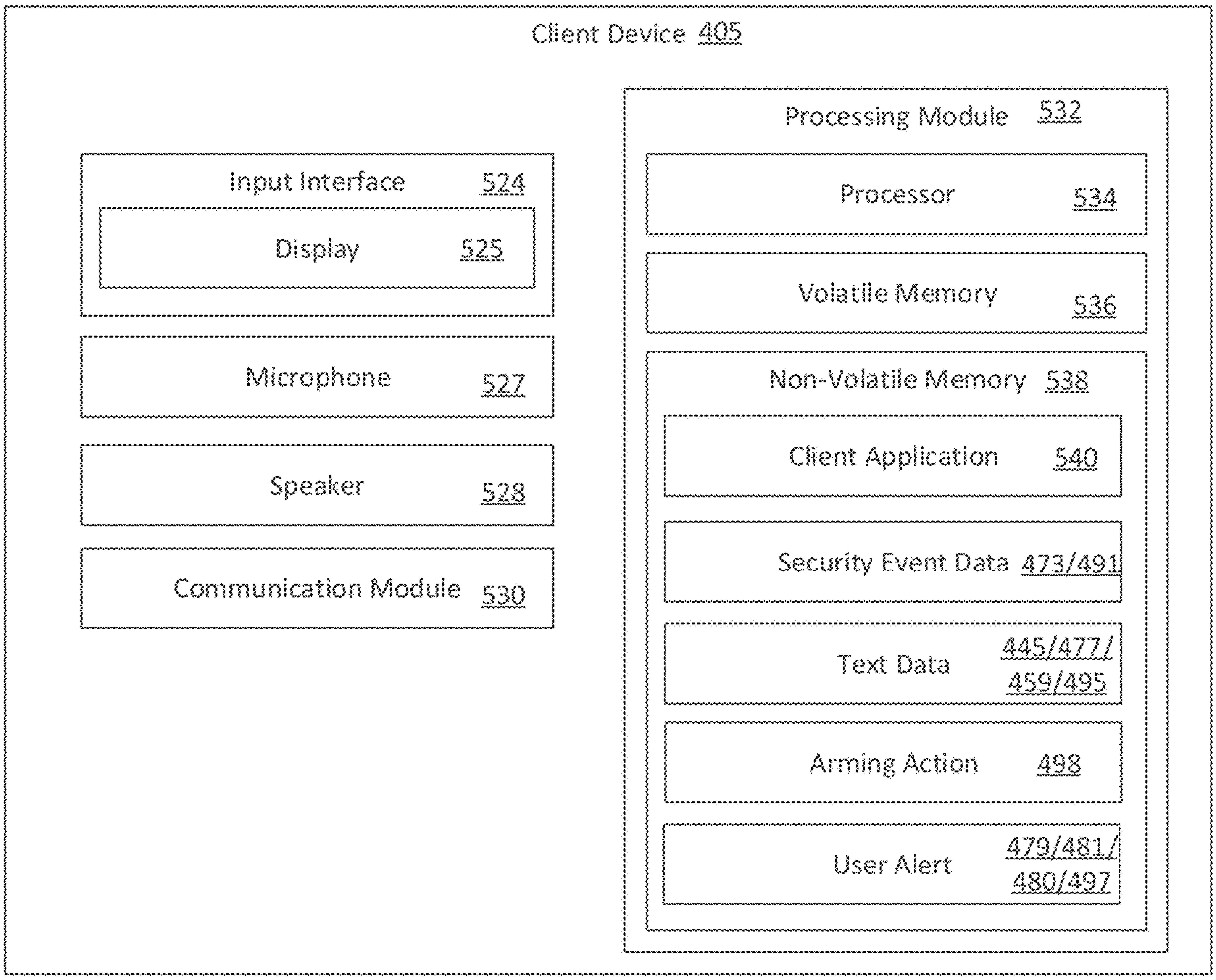

Client Device 405
Processing Module 532
Input Interface 524
Display 525
Processor 534
Volatile Memory 536
Microphone 527
Non-Volatile Memory 538
Client Application 540
Speaker 528
Communication Module 530
Security Event Data 473/491
Text Data 445/477/459/495
Arming Action 498
User Alert 479/481/480/497

FIG. 14

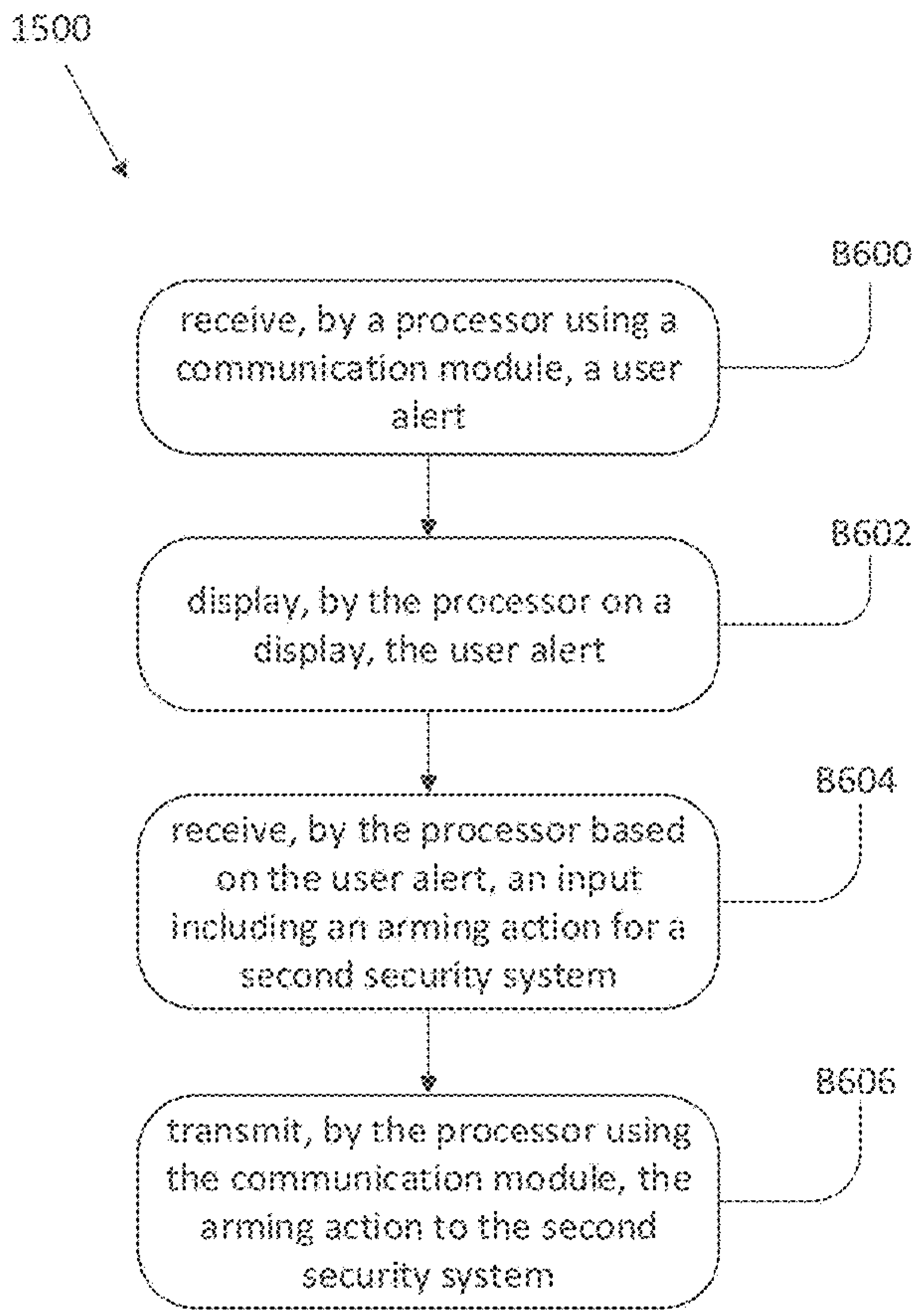

1500
receive, by a processor using a communication module, a user alert
B600
display, by the processor on a display, the user alert
B602
receive, by the processor based on the user alert, an input including an arming action for a second security system
B604
transmit, by the processor using the communication module, the arming action to the second security system
B606

FIG. 15

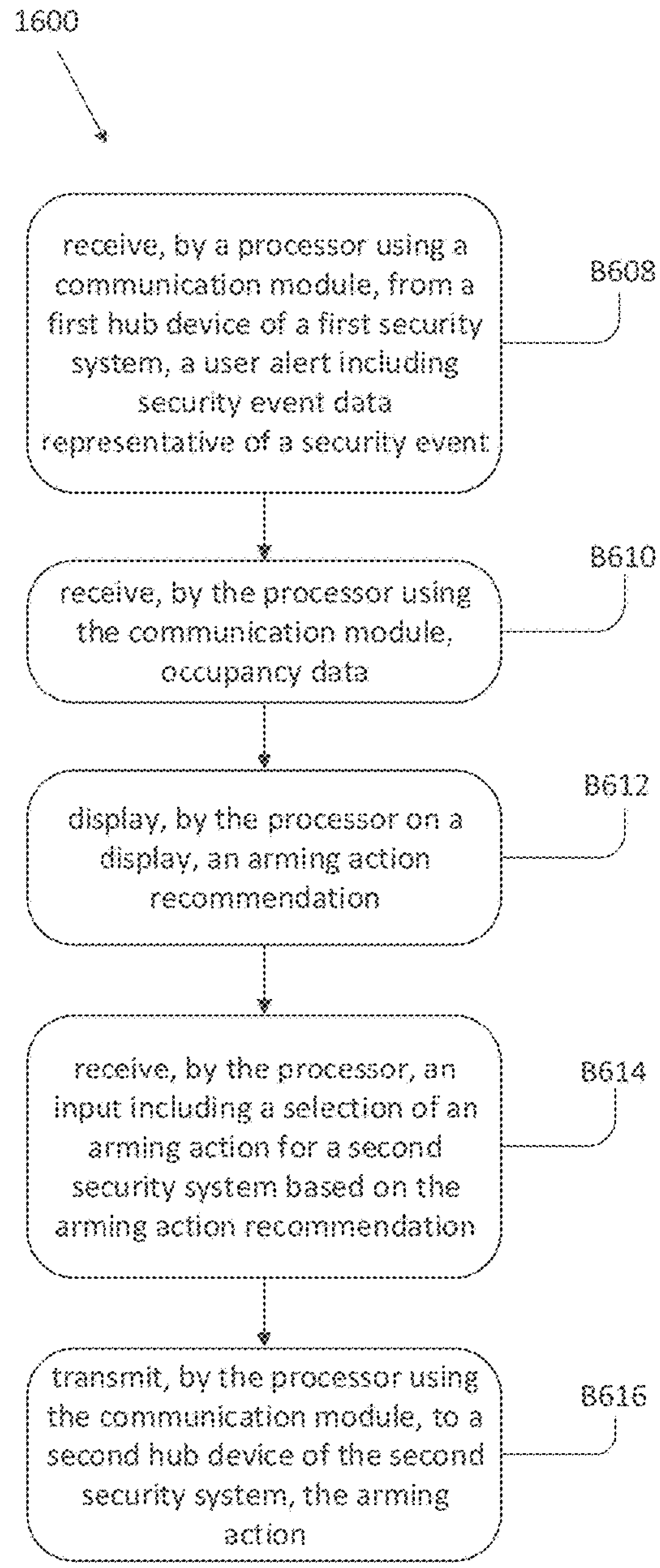

1600
receive, by a processor using a communication module, from a first hub device of a first security system, a user alert including security event data representative of a security event
B608
receive, by the processor using the communication module, occupancy data
B610
display, by the processor on a display, an arming action recommendation
B612
receive, by the processor, an input including a selection of an arming action for a second security system based on the arming action recommendation
B614
transmit, by the processor using the communication module, to a second hub device of the second security system, the arming action
B616

FIG. 16

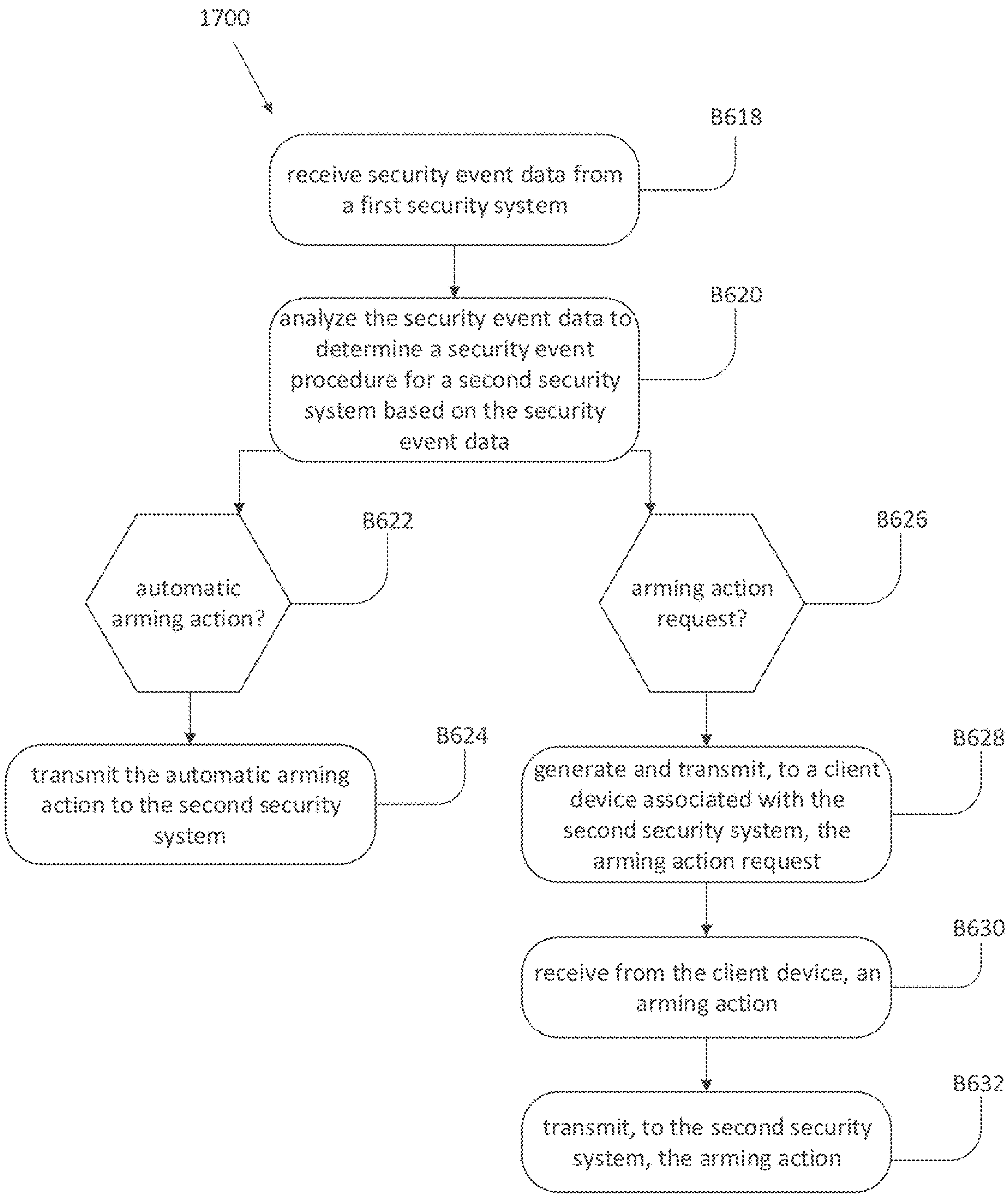

1700
B618
receive security event data from a first security system
B620
analyze the security event data to determine a security event procedure for a second security system based on the security event data
B622
automatic arming action?
B626
arming action request?
B624
transmit the automatic arming action to the second security system
B628
generate and transmit, to a client device associated with the second security system, the arming action request
B630
receive from the client device, an arming action
B632
transmit, to the second security system, the arming action

FIG. 17

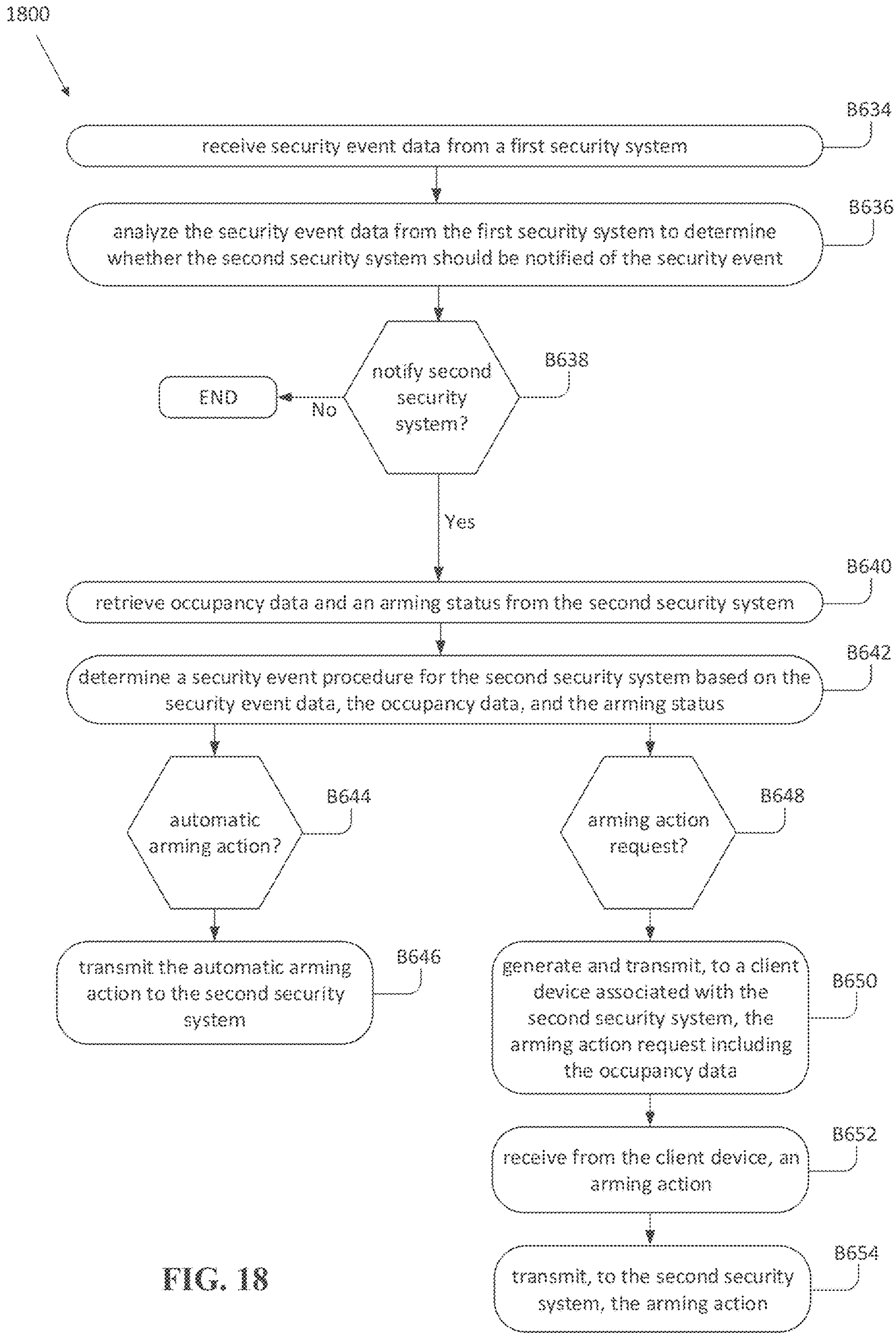
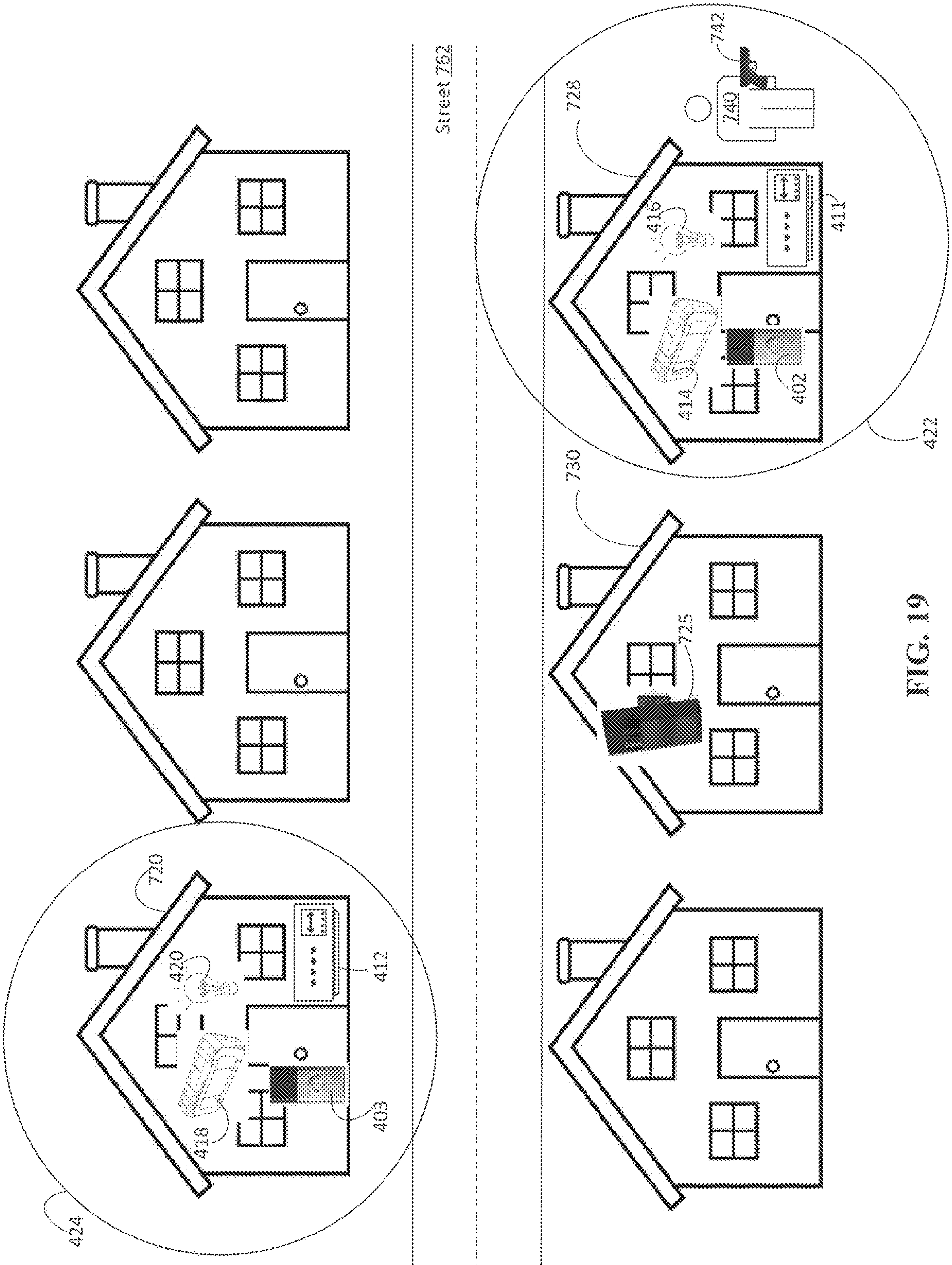

1800
receive security event data from a first security system
B634
analyze the security event data from the first security system to determine whether the second security system should be notified of the security event
B636
notify second security system?
B638
END
No
Yes
retrieve occupancy data and an arming status from the second security system
B640
determine a security event procedure for the second security system based on the security event data, the occupancy data, and the arming status
B642
automatic arming action?
B644
transmit the automatic arming action to the second security system
B646
arming action request?
B648
generate and transmit, to a client device associated with the second security system, the arming action request including the occupancy data
B650
receive from the client device, an arming action
B652
transmit, to the second security system, the arming action
B654

FIG. 18


Street 762
720
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412
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403
424
728
742
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416
411
414
402
422
730
725

FIG. 19

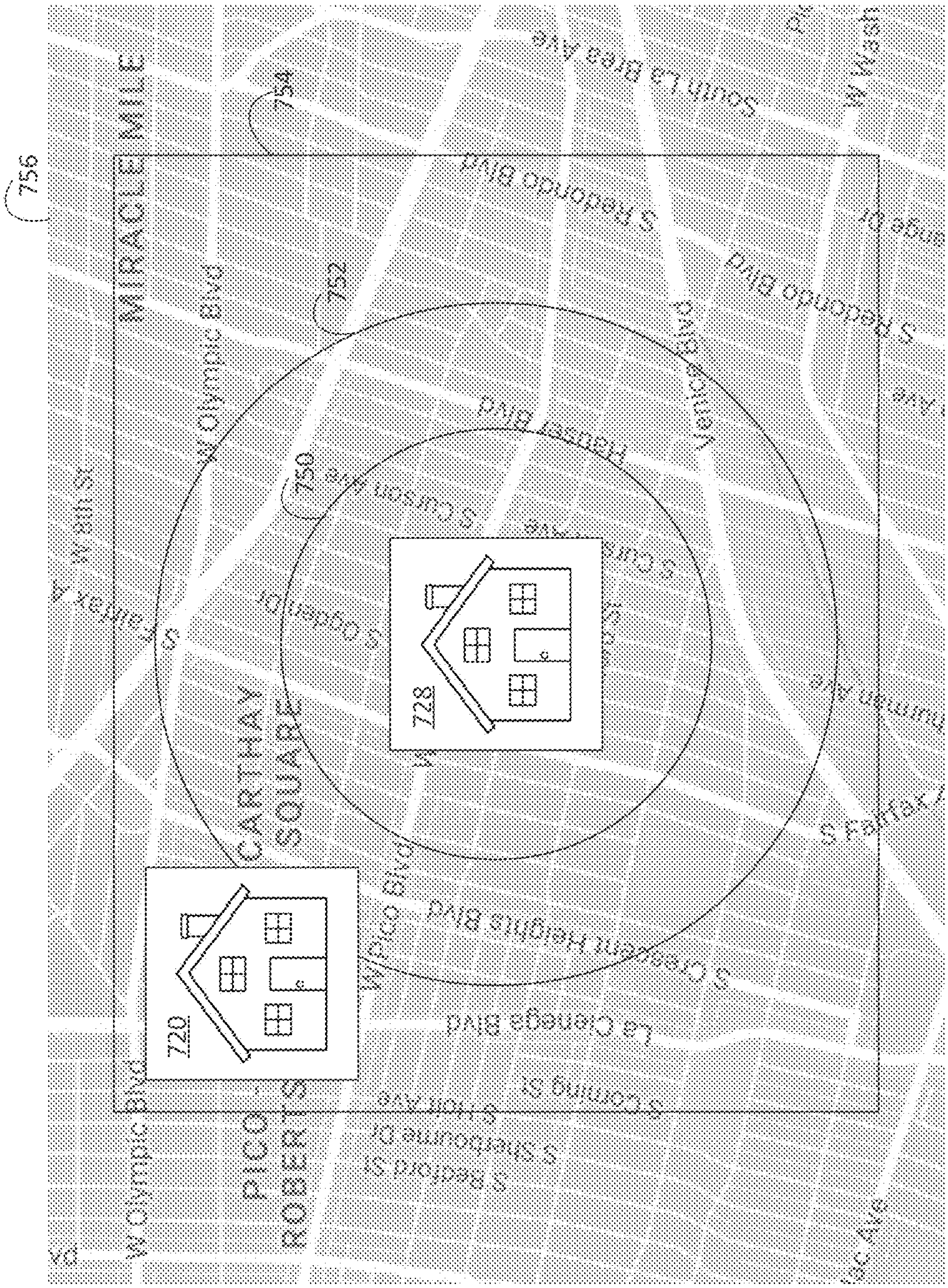
756
754
752
750
728
720
MIRACLE MILE
CARTHAY SQUARE
PICO - ROBERTSON
W Olympic Blvd
W 8th St
S Fairfax Ave
S Redondo Blvd
South La Brea Ave
Venice Blvd
Hauser Blvd
S Curson Ave
S Ogden Dr
W Pico Blvd
S Crescent Heights Blvd
La Cienega Blvd
S Corning St
S Holt Ave
S Sherbourne Dr
S Bedford St
S Fairfax Ave

FIG. 20

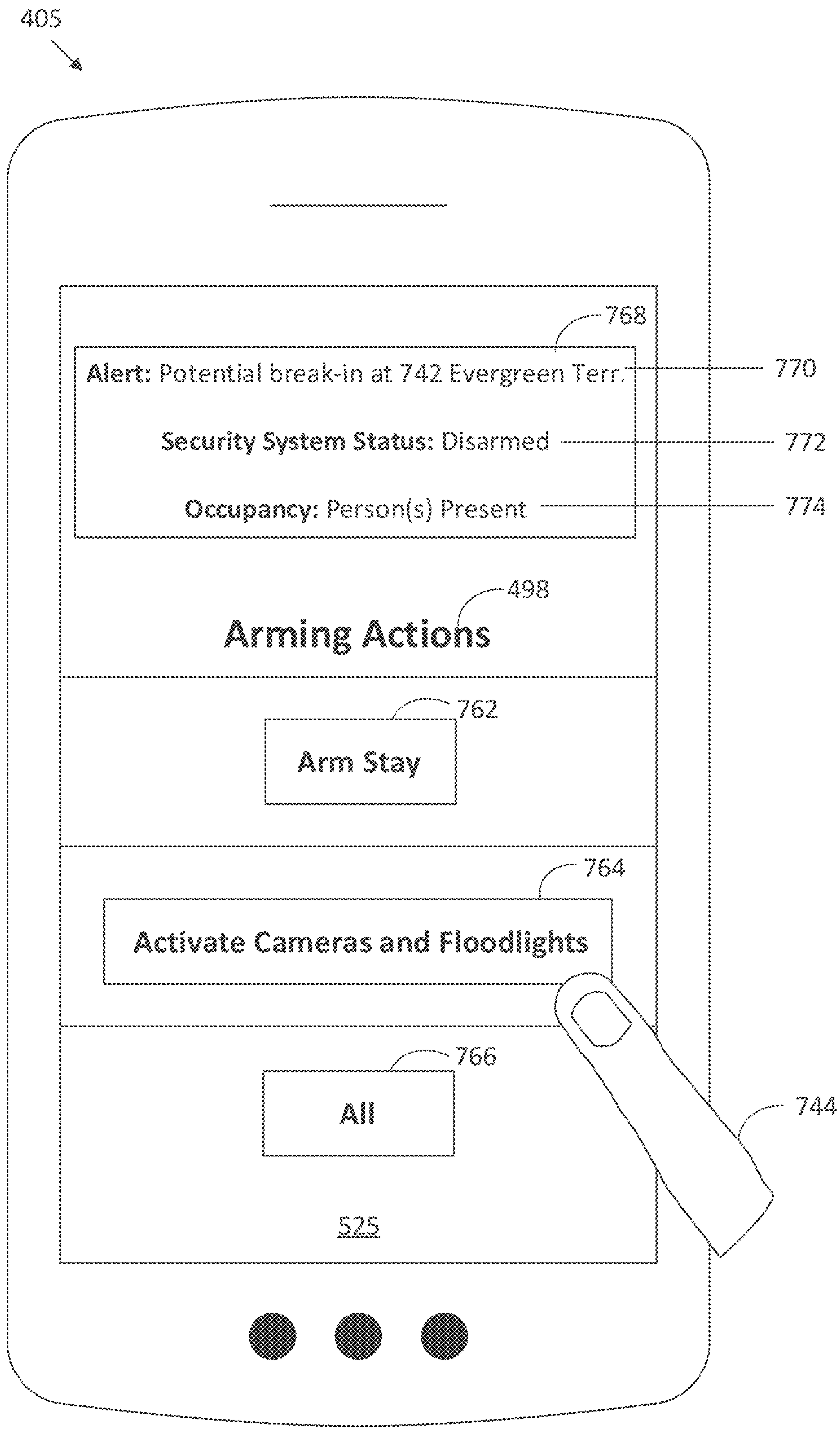
405
768
Alert: Potential break-in at 742 Evergreen Terr.
770
Security System Status: Disarmed
772
Occupancy: Person(s) Present
774
498
Arming Actions
762
Arm Stay
764
Activate Cameras and Floodlights
766
All
744
525

FIG. 21

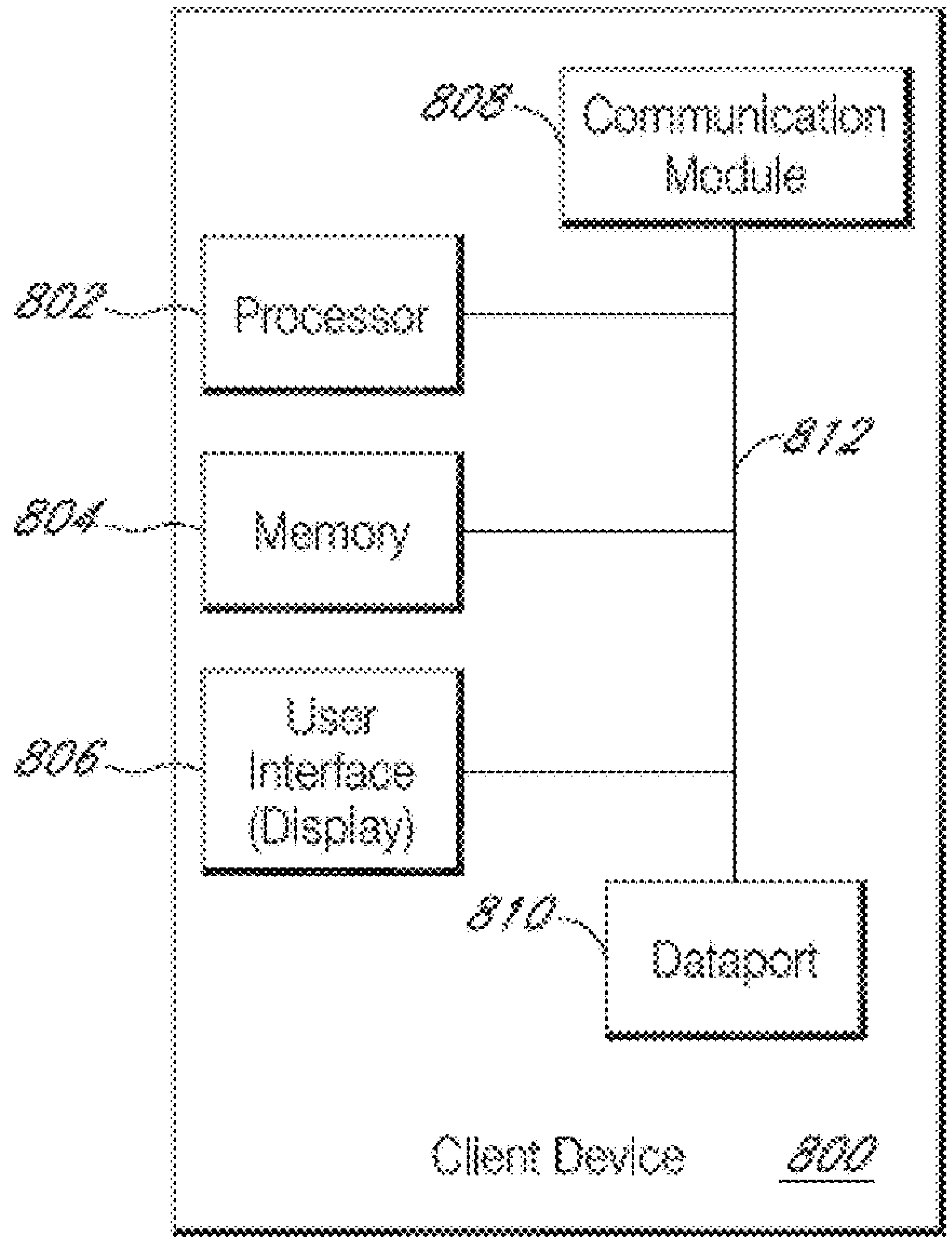

Figure 22

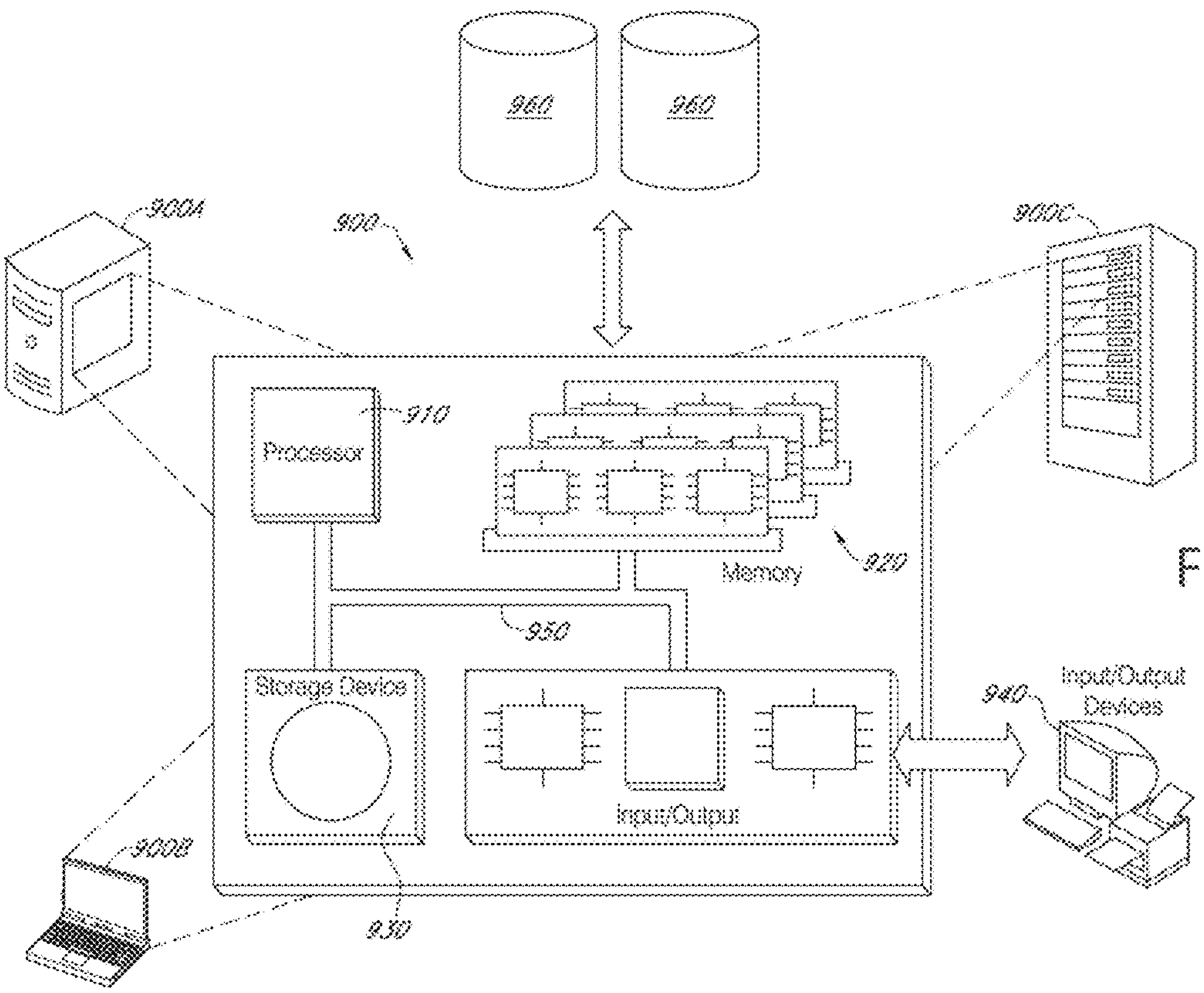

Figure 23

ARMING SECURITY SYSTEMS BASED ON COMMUNICATIONS AMONG A NETWORK OF SECURITY SYSTEMS

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to provisional application Ser. No. 62/544,240, filed on Aug. 11, 2017, the entire contents of which are hereby incorporated by reference.

TECHNICAL FIELD

The present embodiments relate to security systems, including security systems that include sensors, automation devices, and/or audio/video (AN) recording and communication devices. In particular, the present embodiments relate to improvements in the functionality of security systems that strengthen the ability of such systems to reduce crime and enhance public safety.

BACKGROUND

Home safety is a concern for many homeowners and renters. Those seeking to protect or monitor their homes often wish to be informed of breaches to the security of their homes and also have video and audio communications with visitors/trespassers, for example, those visiting/trespassing near an external door or entryway. Security systems that include sensors, automation devices, and/or A/V recording and communication devices, such as doorbells, provide this functionality, and can also aid in crime detection and prevention. For example, sensor information, audio, and/or video captured by a security system, such as by an A/V recording and communication doorbell of a security system, can be uploaded to the cloud and recorded on a remote server. Subsequent review of the sensor information and/or the A/V footage can aid law enforcement in capturing perpetrators of home burglaries and other crimes. Further, the presence of a security system including one or more an A/V recording and communication devices on the exterior of a home, such as a doorbell unit at the entrance of a home, acts as a powerful deterrent against would-be burglars.

BRIEF DESCRIPTION OF THE DRAWINGS

The various embodiments of the arming security systems based on communications among a network of security systems now will be discussed in detail with an emphasis on highlighting the advantageous features. These embodiments depict the novel and non-obvious arming security systems based on communications among a network of security systems shown in the accompanying drawings, which are for illustrative purposes only. These drawings include the following figures, in which like numerals indicate like parts:

FIG. **1** is a functional block diagram illustrating one embodiment of a system including an A/V recording and communication device according to various aspects of the present disclosure;

FIG. **2** is a flowchart illustrating one embodiment of a process for streaming and storing A/V content from an A/V recording and communication device according to various aspects of the present disclosure;

FIG. **3** is a functional block diagram illustrating an embodiment of an A/V recording and communication doorbell according to various aspects of the present disclosure;

FIG. **4** is a front perspective view of an embodiment of an A/V recording and communication doorbell according to various aspects of the present disclosure;

FIG. **5** is a front view of another embodiment of an A/V recording and communication doorbell according to various aspects of the present disclosure;

FIG. **6** is a top view of a passive infrared sensor assembly of the A/V recording and communication doorbell of FIG. **5**, illustrating fields of view of passive infrared sensors of the passive infrared sensor assembly according to various aspects of the present disclosure;

FIG. **7** is a functional block diagram of the components of the A/V recording and communication doorbell of FIG. **5**;

FIG. **8** is a functional block diagram illustrating a system for communicating in a network according to various aspects of the present disclosure;

FIGS. **9-10** are functional block diagrams illustrating embodiments of A/V recording and communication devices according to various aspects of the present disclosure;

FIG. **11-12** are functional block diagrams illustrating embodiments of smart-home hub devices according to various aspects of the present disclosure;

FIG. **13** is a functional block diagram illustrating one embodiment of a backend device according to various aspects of the present disclosure;

FIG. **14** is a functional block diagram illustrating one embodiment of a client device according to various aspects of the present disclosure;

FIGS. **15-18** are flowcharts illustrating processes for arming security systems based on communications among a network of security systems according to various aspects of the present disclosure;

FIG. **19** is an example environment for security systems according to one embodiment of the present disclosure;

FIG. **20** is a top plan view of a neighborhood with a security system according to various aspects of the present disclosure;

FIG. **21** is a screenshot of a graphical user interface (GUI) illustrating aspects of a process for arming security systems based on communications among a network of security systems according to various aspects of the present disclosure;

FIG. **22** is a functional block diagram of a client device on which the present embodiments may be implemented according to various aspects of the present disclosure; and

FIG. **23** is a functional block diagram of a general-purpose computing system on which the present embodiments may be implemented according to various aspects of present disclosure.

DETAILED DESCRIPTION

The various embodiments of the present arming security systems based on communications among a network of security systems have several features, no single one of which is solely responsible for their desirable attributes. Without limiting the scope of the present embodiments as expressed by the claims that follow, their more prominent features now will be discussed. After considering this discussion, and particularly after reading the section entitled "Detailed Description," one will understand how the features of the present embodiments provide the advantages described herein.

One aspect of the present embodiments includes the realization that, historically, security systems have been designed and intended to protect only the property at which the security systems are installed. A typical security system is self-contained, and provides a warning to the property owner only when an intrusion is detected at that same property, and only when the security system is armed. However, potential threats to the property may occur before an intruder crosses the property boundary where the security system is installed, such as when an intrusion occurs at a nearby property. The present embodiments solve this problem by leveraging the functionality of security systems to link together security systems at multiple properties, where each property is protected by a security system and/or an A/V recording and communication device. When an intrusion is detected by a security system and/or an A/V recording and communication device at one of the properties in the network of properties, warnings may be provided to users associated with the other properties in the network that include security systems. Such warnings may provide the users with opportunity to take corrective action, such as by arming their own alarm systems, before the potential threat at the nearby property becomes an actual threat at that user's property. As a result, the safety of that user's property is increased, as well as the safety of the other properties in the network, thereby contributing to public safety.

The following detailed description describes the present embodiments with reference to the drawings. In the drawings, reference numbers label elements of the present embodiments. These reference numbers are reproduced below in connection with the discussion of the corresponding drawing features.

With reference to FIG. **1**, the present embodiments may include an audio/video (A/V) recording and communication device **100**. The A/V recording and communication device **100** may in some embodiments comprise a doorbell, and may be located near the entrance to a structure (not shown), such as a dwelling, a business, a storage facility, etc. The A/V recording and communication device **100** may include a camera **102**, a microphone **104**, and a speaker **106**. The camera **102** may comprise, for example, a high definition (HD) video camera, such as one capable of capturing video images at an image display resolution of 720p, or 1080p, or better. While not shown, the A/V recording and communication device **100** may also include other hardware and/or components, such as a housing, one or more motion sensors (and/or other types of sensors), a button, etc. The A/V recording and communication device **100** may further include similar componentry and/or functionality as the wireless communication doorbells described in US Patent Application Publication Nos. 2015/0022620 (application Ser. No. 14/499,828) and 2015/0022618 (application Ser. No. 14/334,922), both of which are incorporated herein by reference in their entireties as if fully set forth.

With further reference to FIG. **1**, the A/V recording and communication device **100** communicates with a user's network **110**, which may be for example a wired and/or wireless network. If the user's network **110** is wireless, or includes a wireless component, the network **110** may be a Wi-Fi network compatible with the IEEE 802.11 standard and/or other wireless communication standard(s). The user's network **110** is connected to another network **112**, which may comprise, for example, the Internet and/or a public switched telephone network (PSTN). As described below, the A/V recording and communication device **100** may communicate with a user's client device **114** via the user's network **110** and the network **112** (Internet/PSTN). The user's client device **114** may comprise, for example, a mobile telephone (may also be referred to as a cellular telephone), such as a smartphone, a personal digital assistant (PDA), or another communication device. The user's client device **114** comprises a display (not shown) and related components capable of displaying streaming and/or recorded video images. The user's client device **114** may also comprise a speaker and related components capable of broadcasting streaming and/or recorded audio, and may also comprise a microphone. The A/V recording and communication device **100** may also communicate with one or more remote storage device(s) **116** (may be referred to interchangeably as "cloud storage device(s)"), one or more servers **118**, and/or a backend API (application programming interface) **120** via the user's network **110** and the network **112** (Internet/PSTN). While FIG. **1** illustrates the storage device **116**, the server **118**, and the backend API **120** as components separate from the network **112**, it is to be understood that the storage device **116**, the server **118**, and/or the backend API **120** may be considered to be components of the network **112**.

The network **112** may be any wireless network or any wired network, or a combination thereof, configured to operatively couple the above-mentioned modules, devices, and systems as shown in FIG. **1**. For example, the network **112** may include one or more of the following: a PSTN (public switched telephone network), the Internet, a local intranet, a PAN (Personal Area Network), a LAN (Local Area Network), a WAN (Wide Area Network), a MAN (Metropolitan Area Network), a virtual private network (VPN), a storage area network (SAN), a frame relay connection, an Advanced Intelligent Network (AIN) connection, a synchronous optical network (SONET) connection, a digital T1, T3, E1 or E3 line, a Digital Data Service (DDS) connection, a DSL (Digital Subscriber Line) connection, an Ethernet connection, an ISDN (Integrated Services Digital Network) line, a dial-up port such as a V.90, V.34, or V.34bis analog modem connection, a cable modem, an ATM (Asynchronous Transfer Mode) connection, or an FDDI (Fiber Distributed Data Interface) or CDDI (Copper Distributed Data Interface) connection. Furthermore, communications may also include links to any of a variety of wireless networks, including WAP (Wireless Application Protocol), GPRS (General Packet Radio Service), GSM (Global System for Mobile Communication), LTE, VoLTE, LoRaWAN, LPWAN, RPMA, LTE Cat-"X" (e.g., LTE Cat 1, LTE Cat 0, LTE CatM1, LTE Cat NB1), CDMA (Code Division Multiple Access), TDMA (Time Division Multiple Access), FDMA (Frequency Division Multiple Access), and/or OFDMA (Orthogonal Frequency Division Multiple Access) cellular phone networks, GPS, CDPD (cellular digital packet data), RIM (Research in Motion, Limited) duplex paging network, Bluetooth radio, or an IEEE 802.11-based radio frequency network. The network can further include or interface with any one or more of the following: RS-232 serial connection, IEEE-1394 (Firewire) connection, Fibre Channel connection, IrDA (infrared) port, SCSI (Small Computer Systems Interface) connection, USB (Universal Serial Bus) connection, or other wired or wireless, digital or analog, interface or connection, mesh or Digi® networking.

According to one or more aspects of the present embodiments, when a person (may be referred to interchangeably as "visitor") arrives at the A/V recording and communication device **100**, the A/V recording and communication device **100** detects the visitor's presence and begins capturing video images within a field of view of the camera **102**. The A/V recording and communication device **100** may also capture audio through the microphone **104**. The A/V recording and communication device **100** may detect the visitor's presence by detecting motion using the camera **102** and/or a motion sensor, and/or by detecting that the visitor has depressed the front button on the A/V recording and communication device **100** (in embodiments in which the A/V recording and communication device **100** comprises a doorbell).

In response to the detection of the visitor, the A/V recording and communication device **100** sends an alert to the user's client device **114** (FIG. **1**) via the user's network **110** and the network **112**. The A/V recording and communication device **100** also sends streaming video, and may also send streaming audio, to the user's client device **114**. If the user answers the alert, two-way audio communication may then occur between the visitor and the user through the A/V recording and communication device **100** and the user's client device **114**. The user may view the visitor throughout the duration of the call, but the visitor cannot see the user (unless the A/V recording and communication device **100** includes a display, which it may in some embodiments).

The video images captured by the camera **102** of the A/V recording and communication device **100** (and the audio captured by the microphone **104**) may be uploaded to the cloud and recorded on the remote storage device **116** (FIG. **1**). In some embodiments, the video and/or audio may be recorded on the remote storage device **116** even if the user chooses to ignore the alert sent to his or her client device **114**.

With further reference to FIG. **1**, the system may further comprise a backend API **120** including one or more components. A backend API (application programming interface) may comprise, for example, a server (e.g., a real server, or a virtual machine, or a machine running in a cloud infrastructure as a service), or multiple servers networked together, exposing at least one API to client(s) accessing it. These servers may include components such as application servers (e.g., software servers), depending upon what other components are included, such as a caching layer, or database layers, or other components. A backend API may, for example, comprise many such applications, each of which communicate with one another using their public APIs. In some embodiments, the API backend may hold the bulk of the user data and offer the user management capabilities, leaving the clients to have very limited state.

The backend API **120** illustrated FIG. **1** may include one or more APIs. An API is a set of routines, protocols, and tools for building software and applications. An API expresses a software component in terms of its operations, inputs, outputs, and underlying types, defining functionalities that are independent of their respective implementations, which allows definitions and implementations to vary without compromising the interface. Advantageously, an API may provide a programmer with access to an application's functionality without the programmer needing to modify the application itself, or even understand how the application works. An API may be for a web-based system, an operating system, or a database system, and it provides facilities to develop applications for that system using a given programming language. In addition to accessing databases or computer hardware like hard disk drives or video cards, an API can ease the work of programming GUI components. For example, an API can facilitate integration of new features into existing applications (a so-called "plug-in API"). An API can also assist otherwise distinct applications with sharing data, which can help to integrate and enhance the functionalities of the applications.

The backend API **120** illustrated in FIG. **1** may further include one or more services (also referred to as network services). A network service is an application that provides data storage, manipulation, presentation, communication, and/or other capability. Network services are often implemented using a client-server architecture based on application-layer network protocols. Each service may be provided by a server component running on one or more computers (such as a dedicated server computer offering multiple services) and accessed via a network by client components running on other devices. However, the client and server components can both be run on the same machine. Clients and servers may have a user interface, and sometimes other hardware associated with them.

FIG. **2** is a flowchart illustrating a process for streaming and storing A/V content from an A/V recording and communication doorbell system according to various aspects of the present disclosure. At block B**200**, the A/V recording and communication device **100** detects the visitor's presence and begins capturing video images within a field of view of the camera **102**. The A/V recording and communication device **100** may also capture audio through the microphone **104**. As described above, the A/V recording and communication device **100** may detect the visitor's presence by detecting motion using the camera **102** and/or a motion sensor, and/or by detecting that the visitor has depressed the front button on the A/V recording and communication device **100** (in embodiments in which the A/V recording and communication device **100** comprises a doorbell).

At block B**202**, a communication module of the A/V recording and communication device **100** sends a connection request, via the user's network **110** and the network **112**, to a device in the network **112**. For example, the network device to which the request is sent may be a server such as the server **118**. The server **118** may comprise a computer program and/or a machine that waits for requests from other machines or software (clients) and responds to them. A server typically processes data. One purpose of a server is to share data and/or hardware and/or software resources among clients. This architecture is called the client-server model. The clients may run on the same computer or may connect to the server over a network. Examples of computing servers include database servers, file servers, mail servers, print servers, web servers, game servers, and application servers. The term server may be construed broadly to include any computerized process that shares a resource to one or more client processes.

In response to the request, at block B**204** the network device may connect the A/V recording and communication device **100** to the user's client device **114** through the user's network **110** and the network **112**. At block B**206**, the A/V recording and communication device **100** may record available audio and/or video data using the camera **102**, the microphone **104**, and/or any other sensor available. At block B**208**, the audio and/or video data is transmitted (streamed) from the A/V recording and communication device **100** to the user's client device **114** via the user's network **110** and the network **112**. At block B**210**, the user may receive a notification on his or her client device **114** with a prompt to either accept or deny the call.

At block B**212**, the process determines whether the user has accepted or denied the call. If the user denies the notification, then the process advances to block B**214**, where the audio and/or video data is recorded and stored at a cloud server. The session then ends at block B**216** and the connection between the A/V recording and communication device **100** and the user's client device **114** is terminated. If, however, the user accepts the notification, then at block B**218** the user communicates with the visitor through the user's client device **114** while audio and/or video data captured by the camera **102**, the microphone **104**, and/or other sensors is streamed to the user's client device **114**. At the end of the call, the user may terminate the connection between the user's client device **114** and the A/V recording and communication device **100** and the session ends at block B**216**. In some embodiments, the audio and/or video data may be recorded and stored at a cloud server (block B**214**) even if the user accepts the notification and communicates with the visitor through the user's client device **114**.

FIGS. **3**-**4** illustrate one embodiment of a low-power-consumption A/V recording and communication doorbell **130** according to various aspects of the present disclosure. FIG. **3** is a functional block diagram illustrating various components of the A/V recording and communication doorbell **130** and their relationships to one another. For example, the A/V recording and communication doorbell **130** includes a pair of terminals **131**, **132** configured to be connected to a source of external AC (alternating-current) power, such as a household AC power supply **134** (may also be referred to as AC mains). The AC power **134** may have a voltage in the range of 16-24 VAC, for example. The incoming AC power **134** may be converted to DC (direct-current) by an AC/DC rectifier **136**. An output of the AC/DC rectifier **136** may be connected to an input of a DC/DC converter **138**, which may step down the voltage from the output of the AC/DC rectifier **136** from 16-24 VDC to a lower voltage of about 5 VDC, for example. In various embodiments, the output of the DC/DC converter **138** may be in a range of from about 2.5 V to about 7.5 V, for example.

With further reference to FIG. **3**, the output of the DC/DC converter **138** is connected to a power manager **140**, which may comprise an integrated circuit including a processor core, memory, and/or programmable input/output peripherals. In one non-limiting example, the power manager **140** may be an off-the-shelf component, such as the BQ24773 chip manufactured by Texas Instruments. As described in detail below, the power manager **140** controls, among other things, an amount of power drawn from the external power supply **134**, as well as an amount of supplemental power drawn from a battery **142**, to power the A/V recording and communication doorbell **130**. The power manager **140** may, for example, limit the amount of power drawn from the external power supply **134** so that a threshold power draw is not exceeded. In one non-limiting example, the threshold power, as measured at the output of the DC/DC converter **138**, may be equal to 1.4 A. The power manager **140** may also control an amount of power drawn from the external power supply **134** and directed to the battery **142** for recharging of the battery **142**. An output of the power manager **140** is connected to a power sequencer **144**, which controls a sequence of power delivery to other components of the A/V recording and communication doorbell **130**, including a communication module **146**, a front button **148**, a microphone **150**, a speaker driver **151**, a speaker **152**, an audio CODEC (Coder-DECoder) **153**, a camera **154**, an infrared (IR) light source **156**, an IR cut filter **158**, a processor **160** (may also be referred to as a controller **160**), a plurality of light indicators **162**, and a controller **164** for the light indicators **162**. Each of these components is described in detail below. The power sequencer **144** may comprise an integrated circuit including a processor core, memory, and/or programmable input/output peripherals. In one non-limiting example, the power sequencer **144** may be an off-the-shelf component, such as the RT5024 chip manufactured by Richtek.

With further reference to FIG. **3**, the A/V recording and communication doorbell **130** further comprises an electronic switch **166** that closes when the front button **148** is depressed. When the electronic switch **166** closes, power from the AC power source **134** is diverted through a signaling device **168** that is external to the A/V recording and communication doorbell **130** to cause the signaling device **168** to emit a sound, as further described below. In one non-limiting example, the electronic switch **166** may be a triac device. The A/V recording and communication doorbell **130** further comprises a reset button **170** configured to initiate a hard reset of the processor **160**, as further described below.

With further reference to FIG. **3**, the processor **160** may perform data processing and various other functions, as described below. The processor **160** may comprise an integrated circuit including a processor core, memory **172**, non-volatile memory **174**, and/or programmable input/output peripherals (not shown). The memory **172** may comprise, for example, DDR3 (double data rate type three synchronous dynamic random-access memory). The non-volatile memory **174** may comprise, for example, NAND flash memory. In the embodiment illustrated in FIG. **3**, the memory **172** and the non-volatile memory **174** are illustrated within the box representing the processor **160**. It is to be understood that the embodiment illustrated in FIG. **3** is merely an example, and in some embodiments the memory **172** and/or the non-volatile memory **174** are not necessarily physically incorporated with the processor **160**. The memory **172** and/or the non-volatile memory **174**, regardless of their physical location, may be shared by one or more other components (in addition to the processor **160**) of the present A/V recording and communication doorbell **130**.

The transfer of digital audio between the user and a visitor may be compressed and decompressed using the audio CODEC **153**, which is operatively coupled to the processor **160**. When the visitor speaks, audio from the visitor is compressed by the audio CODEC **153**, digital audio data is sent through the communication module **146** to the network **112** via the user's network **110**, routed by the server **118** and delivered to the user's client device **114**. When the user speaks, after being transferred through the network **112**, the user's network **110**, and the communication module **146**, the digital audio data is decompressed by the audio CODEC **153** and emitted to the visitor through the speaker **152**, which is driven by the speaker driver **151**.

With further reference to FIG. **3**, some of the present embodiments may include a shunt **176** connected in parallel with the signaling device **168**. The shunt **176** facilitates the ability of the A/V recording and communication doorbell **130** to draw power from the AC power source **134** without inadvertently triggering the signaling device **168**. The shunt **176**, during normal standby operation, presents a relatively low electrical impedance, such as a few ohms, across the terminals of the signaling device **168**. Most of the current drawn by the A/V recording and communication doorbell **130**, therefore, flows through the shunt **176**, and not through the signaling device **168**. The shunt **176**, however, contains electronic circuitry (described below) that switches the shunt **176** between a state of low impedance, such as a few ohms, for example, and a state of high impedance, such as >1K ohms, for example. When the front button **148** of the A/V recording and communication doorbell **130** is pressed, the electronic switch **166** closes, causing the voltage from the AC power source **134** to be impressed mostly across the shunt **176** and the signaling device **168** in parallel, while a small amount of voltage, such as about 1V, is impressed across the electronic switch **166**. The circuitry in the shunt **176** senses this voltage, and switches the shunt **176** to the high impedance state, so that power from the AC power source **134** is diverted through the signaling device **168**. The diverted AC power **134** is above the threshold necessary to cause the signaling device **168** to emit a sound. Pressing the front button **148** of the doorbell **130** therefore causes the signaling device **168** to "ring," alerting any person(s) within the structure to which the doorbell **130** is mounted that there is a visitor at the front door (or at another location corresponding to the location of the doorbell **130**). In one non-limiting example, the electronic switch **166** may be a triac device.

With reference to FIG. **4**, the A/V recording and communication doorbell **130** further comprises a housing **178** having an enclosure (not shown), a back plate (not shown) secured to the rear of the enclosure, and a shell **184** overlying the enclosure. A front surface of the A/V recording and communication doorbell **130** may include the button **148** (may also be referred to as front button **148**), which is operatively connected to a processor (not shown). In a process similar to that described above with reference to FIG. **2**, when a visitor presses the front button **148**, an alert may be sent to the user's client device to notify the user that someone is at his or her front door (or at another location corresponding to the location of the A/V recording and communication doorbell **130**). With further reference to FIG. **4**, the A/V recording and communication doorbell **130** further includes the camera **154**, which is operatively connected to the processor **160**, and which is located behind a shield **192**. As described in detail below, the camera **154** is configured to capture video images from within its field of view. Those video images can be streamed to the user's client device and/or uploaded to a remote network device for later viewing according to a process similar to that described above with reference to FIG. **2**.

With further reference to FIG. **4**, the shell **184** includes a central opening **204** in a front surface. The central opening **204** is sized and shaped to accommodate the shield **192**. The shield **192** includes an upper portion **214** (located above and to the sides of the front button **148**) and a lower portion **216** (located below and to the sides of the front button **148**). The upper portion **214** of the shield **192** may be transparent or translucent so that it does not interfere with the field of view of the camera **154**. As described in detail below, a microphone, which is operatively connected to the processor, is located behind the upper portion **214** of the shield **192**. The upper portion **214**, therefore, may include an opening **218** that facilitates the passage of sound through the shield **192** so that the microphone is better able to pick up sounds from the area around the A/V recording and communication doorbell **130**.

The lower portion **216** of the shield **192** may comprise a material that is substantially transparent to infrared (IR) light, but partially or mostly opaque with respect to light in the visible spectrum. The lower portion **216** of the shield **192**, therefore, does not interfere with transmission of IR light from the IR light source, which is located behind the lower portion **216**. As described in detail below, the IR light source and the IR cut filter, which are both operatively connected to the processor, facilitate "night vision" functionality of the camera **154**.

Several advantages flow from the ability of the present embodiments to be connected to the existing household AC power supply. For example, the camera of the present A/V recording and communication doorbell can be powered on continuously. In a typical battery-powered A/V recording and communication doorbell, the camera is powered on only part of the time so that the battery does not drain too rapidly. The present embodiments, by contrast, do not rely on a battery as a primary (or sole) power supply, and are thus able to keep the camera powered on continuously. Because the camera is able to be powered on continuously, it can always be recording, and recorded footage can be continuously stored in a rolling buffer or sliding window. In some embodiments, about 10-15 seconds of recorded footage can be continuously stored in the rolling buffer or sliding window. Also, because the camera is able to be powered on continuously, it can be used for motion detection, thus eliminating any need for a separate motion detection device, such as a passive infrared sensor (PIR). Eliminating the PIR simplifies the design of the A/V recording and communication doorbell and enables the doorbell to be made more compact, although in some alternative embodiments the doorbell may include one or more PIRs and/or other motion detectors, heat source detectors, etc. Also, because the camera is able to be powered on continuously, it can be used as a light detector for use in controlling the current state of the IR cut filter and turning the IR LED on and off. Using the camera as a light detector eliminates any need for a separate light detector, thereby further simplifying the design of the A/V recording and communication doorbell and enabling the doorbell to be made even more compact, although in some alternative embodiments the doorbell may include a separate light detector.

FIGS. **5**-**7** illustrate another embodiment of a wireless audio/video (A/V) communication doorbell **330** according to an aspect of present embodiments. FIG. **5** is a front view of the wireless A/V communication doorbell **330**. As described below, the doorbell **330** is configured to be connected to an external power source, such as household wiring, but is also configured to be powered by an on-board rechargeable battery instead of, or in addition to, the external power source.

The doorbell **330** includes a faceplate **335** mounted to a back plate (not shown). The faceplate **335** protects the internal contents of the doorbell **330** and serves as an exterior front surface of the doorbell **330**. The faceplate **335** may include a button **333** and a light pipe **336**. The light pipe **336** may comprise any suitable material, including, without limitation, transparent plastic, that is capable of allowing light produced within the doorbell **330** to pass through. The light may be produced by one or more light-emitting components, such as light-emitting diodes (LED's), contained within the doorbell **330**, as further described below. The button **333** may make contact with a button actuator (not shown) located within the doorbell **330** when the button **333** is pressed by a visitor. When pressed, the button **333** may trigger one or more functions of the doorbell **330**, as further described below.

With further reference to FIG. **5**, the doorbell **330** further includes an enclosure **331** that engages the faceplate **335**. The doorbell **330** further includes a lens **332**. In some embodiments, the lens may comprise a Fresnel lens, which may be patterned to deflect incoming light into one or more infrared sensors located within the doorbell **330**. The doorbell **330** further includes a camera **334**, which captures video data when activated, as described below.

The doorbell **330** further comprises passive infrared (PIR) sensors **344-1**, **344-2**, **344-3** (FIG. **6**) (hereinafter collectively referred to as the PIR sensors **344**), which are secured on or within a PIR sensor holder **343** (FIG. **6**), and the assembly resides behind the lens **332**. In some embodiments, the doorbell **330** may comprise three PIR sensors **344-1**, **344-2**, **344-3**, as further described below, but in other embodiments any number of PIR sensors **344** may be provided. In some embodiments, one or more of the PIR sensors **344** may comprise a pyroelectric infrared sensor.

The PIR sensors **344** may be any type of sensor capable of detecting and communicating the presence of a heat source within their field of view. Further, alternative embodiments may comprise one or more motion sensors either in place of or in addition to the PIR sensors **344**.

FIG. **6** is a top view of the passive infrared sensor assembly **379** illustrating the fields of view of the passive infrared sensors **344**. In the illustrated embodiment, the side faces of the passive infrared sensor holder **343** are angled at 55° facing outward from the center face, and each PIR sensor **344** has a field of view of 110°. However, these angles may be increased or decreased as desired. Zone 1 is the area that is visible only to a first one of the passive infrared sensors **344-1**. Zone 2 is the area that is visible only to the first one of the PIR sensor **344-1** and a second one of the PIR sensors **344-2**. Zone 3 is the area that is visible only to a second one of the PIR sensors **344-2**. Zone 4 is the area that is visible only to the second one of the PIR sensors **344-2** and a third one of the passive infrared sensors **344-3**. Zone 5 is the area that is visible only to the third one of the PIR sensors **344-3**. In some embodiments, the doorbell **130** may be capable of determining the direction that an object is moving based upon which zones are triggered in a time sequence.

FIG. **7** is a functional block diagram of the components within or in communication with the doorbell **330**, according to an aspect of the present embodiments. The bracket PCB **349** may comprise an accelerometer **350**, a barometer **351**, a humidity sensor **352**, and a temperature sensor **353**. The accelerometer **350** may be one or more sensors capable of sensing motion and/or acceleration. The barometer **351** may be one or more sensors capable of determining the atmospheric pressure of the surrounding environment in which the bracket PCB **349** may be located. The humidity sensor **352** may be one or more sensors capable of determining the amount of moisture present in the atmospheric environment in which the bracket PCB **349** may be located. The temperature sensor **353** may be one or more sensors capable of determining the temperature of the ambient environment in which the bracket PCB **349** may be located. The bracket PCB **349** may be located outside the housing of the doorbell **330** so as to reduce interference from heat, pressure, moisture, and/or other stimuli generated by the internal components of the doorbell **330**.

With further reference to FIG. **7**, the bracket PCB **349** may further comprise terminal screw inserts **354**, which may be configured to receive the terminal screws and transmit power to the electrical contacts on the mounting bracket. The bracket PCB **349** may be electrically and/or mechanically coupled to the power PCB **348** through the terminal screws, the terminal screw inserts **354**, the spring contacts **340**, and the electrical contacts. The terminal screws may receive electrical wires located at the surface to which the doorbell **330** is mounted, such as the wall of a building, so that the doorbell can receive electrical power from the building's electrical system. Upon the terminal screws being secured within the terminal screw inserts **354**, power may be transferred to the bracket PCB **349**, and to all of the components associated therewith, including the electrical contacts. The electrical contacts may transfer electrical power to the power PCB **348** by mating with the spring contacts **340**.

With further reference to FIG. **7**, the front PCB **346** may comprise a light sensor **355**, one or more light-emitting components, such as LED's **356**, one or more speakers **357**, and a microphone **358**. The light sensor **355** may be one or more sensors capable of detecting the level of ambient light of the surrounding environment in which the doorbell **330** may be located. LED's **356** may be one or more light-emitting diodes capable of producing visible light when supplied with power. The speakers **357** may be any electromechanical device capable of producing sound in response to an electrical signal input. The microphone **358** may be an acoustic-to-electric transducer or sensor capable of converting sound waves into an electrical signal. When activated, the LED's **356** may illuminate the light pipe **336** (FIG. **5**). The front PCB **346** and all components thereof may be electrically coupled to the power PCB **348**, thereby allowing data and/or power to be transferred to and from the power PCB **348** and the front PCB **346**.

The speakers **357** and the microphone **358** may be coupled to the camera processor **370** through an audio CODEC **361**. For example, the transfer of digital audio from the user's client device **114** and the speakers **357** and the microphone **358** may be compressed and decompressed using the audio CODEC **361**, coupled to the camera processor **370**. Once compressed by audio CODEC **361**, digital audio data may be sent through the communication module **364** to the network **112**, routed by one or more servers **118**, and delivered to the user's client device **114** (FIG. **1**). When the user speaks, after being transferred through the network **112**, digital audio data is decompressed by audio CODEC **361** and emitted to the visitor via the speakers **357**.

With further reference to FIG. **7**, the power PCB **348** may comprise a power management module **362**, a microcontroller **363** (may also be referred to as "processor," "CPU," or "controller"), the communication module **364**, and power PCB non-volatile memory **365**. In certain embodiments, the power management module **362** may comprise an integrated circuit capable of arbitrating between multiple voltage rails, thereby selecting the source of power for the doorbell **330**. The battery **366**, the spring contacts **340**, and/or the connector **360** may each provide power to the power management module **362**. The power management module **362** may have separate power rails dedicated to the battery **366**, the spring contacts **340**, and the connector **360**. In one aspect of the present disclosure, the power management module **362** may continuously draw power from the battery **366** to power the doorbell **330**, while at the same time routing power from the spring contacts **340** and/or the connector **360** to the battery **366**, thereby allowing the battery **366** to maintain a substantially constant level of charge. Alternatively, the power management module **362** may continuously draw power from the spring contacts **340** and/or the connector **360** to power the doorbell **330**, while only drawing from the battery **366** when the power from the spring contacts **340** and/or the connector **360** is low or insufficient. Still further, the battery **366** may comprise the sole source of power for the doorbell **330**. In such embodiments, the spring contacts **340** may not be connected to a source of power. When the battery **366** is depleted of its charge, it may be recharged, such as by connecting a power source to the connector **360**. The power management module **362** may also serve as a conduit for data between the connector **360** and the microcontroller **363**.

With further reference to FIG. **7**, in certain embodiments the microcontroller **363** may comprise an integrated circuit including a processor core, memory, and programmable input/output peripherals. The microcontroller **363** may receive input signals, such as data and/or power, from the PIR sensors **344**, the bracket PCB **349**, the power management module **362**, the light sensor **355**, the microphone **358**, and/or the communication module **364**, and may perform various functions as further described below. When the microcontroller **363** is triggered by the PIR sensors **344**, the microcontroller **363** may be triggered to perform one or more functions. When the light sensor **355** detects a low level of ambient light, the light sensor **355** may trigger the microcontroller **363** to enable "night vision," as further described below. The microcontroller **363** may also act as a conduit for data communicated between various components and the communication module **364**.

With further reference to FIG. **7**, the communication module **364** may comprise an integrated circuit including a processor core, memory, and programmable input/output peripherals. The communication module **364** may also be configured to transmit data wirelessly to a remote network device, and may include one or more transceivers (not shown). The wireless communication may comprise one or more wireless networks, such as, without limitation, Wi-Fi, cellular, Bluetooth, and/or satellite networks. The communication module **364** may receive inputs, such as power and/or data, from the camera PCB **347**, the microcontroller **363**, the button **333**, the reset button **359**, and/or the power PCB non-volatile memory **365**. When the button **333** is pressed, the communication module **364** may be triggered to perform one or more functions. When the reset button **359** is pressed, the communication module **364** may be triggered to erase any data stored at the power PCB non-volatile memory **365** and/or at the camera PCB memory **369**. The communication module **364** may also act as a conduit for data communicated between various components and the microcontroller **363**. The power PCB non-volatile memory **365** may comprise flash memory configured to store and/or transmit data. For example, in certain embodiments the power PCB non-volatile memory **365** may comprise serial peripheral interface (SPI) flash memory.

With further reference to FIG. **7**, the camera PCB **347** may comprise components that facilitate the operation of the camera **334**. For example, an imager **371** may comprise a video recording sensor and/or a camera chip. In one aspect of the present disclosure, the imager **371** may comprise a complementary metal-oxide semiconductor (CMOS) array, and may be capable of recording high definition (e.g., 1080p or better) video files. A camera processor **370** may comprise an encoding and compression chip. In some embodiments, the camera processor **370** may comprise a bridge processor. The camera processor **370** may process video recorded by the imager **371** and audio recorded by the microphone **358**, and may transform this data into a form suitable for wireless transfer by the communication module **364** to a network. The camera PCB memory **369** may comprise volatile memory that may be used when data is being buffered or encoded by the camera processor **370**. For example, in certain embodiments the camera PCB memory **369** may comprise synchronous dynamic random-access memory (SD RAM). IR LED's **368** may comprise light-emitting diodes capable of radiating infrared light. IR cut filter **367** may comprise a system that, when triggered, configures the imager **371** to see primarily infrared light as opposed to visible light. When the light sensor **355** detects a low level of ambient light (which may comprise a level that impedes the performance of the imager **371** in the visible spectrum), the IR LED's **368** may shine infrared light through the doorbell **330** enclosure out to the environment, and the IR cut filter **367** may enable the imager **371** to see this infrared light as it is reflected or refracted off of objects within the field of view of the doorbell. This process may provide the doorbell **330** with the "night vision" function mentioned above.

Some of the present embodiments may comprise computer vision for one or more aspects, such as object and/or facial recognition. Computer vision includes methods for acquiring, processing, analyzing, and understanding images and, in general, high-dimensional data from the real world in order to produce numerical or symbolic information, e.g., in the form of decisions. Computer vision seeks to duplicate the abilities of human vision by electronically perceiving and understanding an image. Understanding in this context means the transformation of visual images (the input of the retina) into descriptions of the world that can interface with other thought processes and elicit appropriate action. This image understanding can be seen as the disentangling of symbolic information from image data using models constructed with the aid of geometry, physics, statistics, and learning theory. Computer vision has also been described as the enterprise of automating and integrating a wide range of processes and representations for vision perception. As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences, views from multiple cameras, or multi-dimensional data from a scanner. As a technological discipline, computer vision seeks to apply its theories and models for the construction of computer vision systems.

One aspect of computer vision comprises determining whether or not the image data contains some specific object, feature, or activity. Different varieties of computer vision recognition include: Object Recognition (also called object classification)—One or several pre-specified or learned objects or object classes can be recognized, usually together with their 2D positions in the image or 3D poses in the scene. Identification—An individual instance of an object is recognized. Examples include identification of a specific person's face or fingerprint, identification of handwritten digits, or identification of a specific vehicle. Detection—The image data are scanned for a specific condition. Examples include detection of possible abnormal cells or tissues in medical images or detection of a vehicle in an automatic road toll system. Detection based on relatively simple and fast computations is sometimes used for finding smaller regions of interesting image data that can be further analyzed by more computationally demanding techniques to produce a correct interpretation.

Several specialized tasks based on computer vision recognition exist, such as: Optical Character Recognition (OCR)—Identifying characters in images of printed or handwritten text, usually with a view to encoding the text in a format more amenable to editing or indexing (e.g., ASCII). 2D Code Reading—Reading of 2D codes such as data matrix and QR codes. Facial Recognition. Shape Recognition Technology (SRT)—Differentiating human beings (e.g., head and shoulder patterns) from objects.

Typical functions and components (e.g., hardware) found in many computer vision systems are described in the following paragraphs. The present embodiments may include at least some of these aspects. For example, with reference to FIG. **3**, embodiments of the present AN recording and communication doorbell **130** may include a computer vision module **163**. The computer vision module **163** may include any of the components (e.g., hardware) and/or functionality described herein with respect to computer vision, including, without limitation, one or more cameras, sensors, and/or processors. In some of the present embodiments, the microphone **150**, the camera **154**, and/or the imaging processor **240** may be components of the computer vision module **163**.

Image acquisition—A digital image is produced by one or several image sensors, which, besides various types of light-sensitive cameras, may include range sensors, tomography devices, radar, ultra-sonic cameras, etc. Depending on the type of sensor, the resulting image data may be a 2D image, a 3D volume, or an image sequence. The pixel values may correspond to light intensity in one or several spectral bands (gray images or color images), but can also be related to various physical measures, such as depth, absorption or reflectance of sonic or electromagnetic waves, or nuclear magnetic resonance.

Pre-processing—Before a computer vision method can be applied to image data in order to extract some specific piece of information, it is usually beneficial to process the data in order to assure that it satisfies certain assumptions implied by the method. Examples of pre-processing include, but are not limited to re-sampling in order to assure that the image coordinate system is correct, noise reduction in order to assure that sensor noise does not introduce false information, contrast enhancement to assure that relevant information can be detected, and scale space representation to enhance image structures at locally appropriate scales.

Feature extraction—Image features at various levels of complexity are extracted from the image data. Typical examples of such features are: Lines, edges, and ridges; Localized interest points such as corners, blobs, or points; More complex features may be related to texture, shape, or motion.

Detection/segmentation—At some point in the processing a decision may be made about which image points or regions of the image are relevant for further processing. Examples are: Selection of a specific set of interest points; Segmentation of one or multiple image regions that contain a specific object of interest; Segmentation of the image into nested scene architecture comprising foreground, object groups, single objects, or salient object parts (also referred to as spatial-taxon scene hierarchy).

High-level processing—At this step, the input may be a small set of data, for example a set of points or an image region that is assumed to contain a specific object. The remaining processing may comprise, for example: Verification that the data satisfy model-based and application-specific assumptions; Estimation of application-specific parameters, such as object pose or object size; Image recognition—classifying a detected object into different categories; Image registration—comparing and combining two different views of the same object.

Decision making—Making the final decision required for the application, for example match/no-match in recognition applications.

One or more of the present embodiments may include a vision processing unit (not shown separately, but may be a component of the computer vision module **163**). A vision processing unit is an emerging class of microprocessor; it is a specific type of AI (artificial intelligence) accelerator designed to accelerate machine vision tasks. Vision processing units are distinct from video processing units (which are specialized for video encoding and decoding) in their suitability for running machine vision algorithms such as convolutional neural networks, SIFT, etc. Vision processing units may include direct interfaces to take data from cameras (bypassing any off-chip buffers), and may have a greater emphasis on on-chip dataflow between many parallel execution units with scratchpad memory, like a manycore DSP (digital signal processor). But, like video processing units, vision processing units may have a focus on low precision fixed-point arithmetic for image processing.

Some of the present embodiments may use facial recognition hardware and/or software, as a part of the computer vision system. Various types of facial recognition exist, some or all of which may be used in the present embodiments.

Some face recognition algorithms identify facial features by extracting landmarks, or features, from an image of the subject's face. For example, an algorithm may analyze the relative position, size, and/or shape of the eyes, nose, cheekbones, and jaw. These features are then used to search for other images with matching features. Other algorithms normalize a gallery of face images and then compress the face data, only saving the data in the image that is useful for face recognition. A probe image is then compared with the face data. One of the earliest successful systems is based on template matching techniques applied to a set of salient facial features, providing a sort of compressed face representation.

Recognition algorithms can be divided into two main approaches, geometric, which looks at distinguishing features, or photometric, which is a statistical approach that distills an image into values and compares the values with templates to eliminate variances.

Popular recognition algorithms include principal component analysis using eigenfaces, linear discriminant analysis, elastic bunch graph matching using the Fisherface algorithm, the hidden Markov model, the multilinear subspace learning using tensor representation, and the neuronal motivated dynamic link matching.

Further, a newly emerging trend, claimed to achieve improved accuracy, is three-dimensional face recognition. This technique uses 3D sensors to capture information about the shape of a face. This information is then used to identify distinctive features on the surface of a face, such as the contour of the eye sockets, nose, and chin.

One advantage of 3D face recognition is that it is not affected by changes in lighting like other techniques. It can also identify a face from a range of viewing angles, including a profile view. Three-dimensional data points from a face vastly improve the precision of face recognition. 3D research is enhanced by the development of sophisticated sensors that do a better job of capturing 3D face imagery. The sensors work by projecting structured light onto the face. Up to a dozen or more of these image sensors can be placed on the same CMOS chip—each sensor captures a different part of the spectrum.

Another variation is to capture a 3D picture by using three tracking cameras that point at different angles; one camera pointing at the front of the subject, a second one to the side, and a third one at an angle. All these cameras work together to track a subject's face in real time and be able to face detect and recognize.

Another emerging trend uses the visual details of the skin, as captured in standard digital or scanned images. This technique, called skin texture analysis, turns the unique lines, patterns, and spots apparent in a person's skin into a mathematical space.

Another form of taking input data for face recognition is by using thermal cameras, which may only detect the shape of the head and ignore the subject accessories such as glasses, hats, or make up.

Further examples of automatic identification and data capture (AIDC) and/or computer vision that can be used in the present embodiments to verify the identity and/or authorization of a person include, without limitation, biometrics. Biometrics refers to metrics related to human characteristics. Biometrics authentication (or realistic authentication) is used in various forms of identification and access control. Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers can be physiological characteristics and/or behavioral characteristics. Physiological characteristics may be related to the shape of the body. Examples include, but are not limited to, fingerprints, palm veins, facial recognition, three-dimensional facial recognition, skin texture analysis, DNA, palm prints, hand geometry, iris recognition, retina recognition, and odor/scent recognition. Behavioral characteristics may be related to the pattern of behavior of a person, including, but not limited to, typing rhythm, gait, and voice recognition.

The present embodiments may use any one, or any combination of more than one, of the foregoing biometrics to identify and/or authenticate a person who is either suspicious or who is authorized to take certain actions with respect to a property or expensive item of collateral. For example, the computer vision module **163**, and/or the camera **154** and/or the processor **160** may receive information about the person using any one, or any combination of more than one, of the foregoing biometrics.

One aspect of the present embodiments includes the realization that, historically, security systems have been designed and intended to protect only the property at which the security systems are installed. A typical security system is self-contained, and provides a warning to the property owner only when an intrusion is detected at that same property, and only when the security system is armed. However, potential threats to the property may occur before an intruder crosses the property boundary where the security system is installed, such as when an intrusion occurs at a nearby property. The present embodiments solve this problem by leveraging the functionality of security systems to link together security systems at multiple properties, where each property is protected by a security system and/or an A/V recording and communication device. When an intrusion is detected by a security system and/or an A/V recording and communication device at one of the properties in the network of properties, warnings may be provided to users associated with the other properties in the network that include security systems. Such warnings may provide the users with opportunity to take corrective action, such as by arming their own alarm systems, before the potential threat at the nearby property becomes an actual threat at that user's property. As a result, the safety of that user's property is increased, as well as the safety of the other properties in the network, thereby contributing to public safety.

For example, in some of the present embodiments, a method for a security network may include, in response to a security event detected by a first security system, receiving security event data from the first security system; analyzing the security event data to determine a security event procedure for a second security system based on the security event data; when the security event procedure for the second security system includes an automatic arming action; transmitting the automatic arming action to the second security system; when the security event procedure for the second security system includes an arming action request: generating and transmitting, to a client device associated with the second security system, the arming action request; in response to transmitting the arming action request, receiving from the client device, an arming action; and transmitting, to the second security system, the arming action.

FIG. **8** is a functional block diagram illustrating a system **400** for communicating in a network according to various aspects of the present disclosure. The system **400** may include one or more first A/V recording and communication devices **402** configured to access a user's network **408** to connect to a network (Internet/PSTN) **410**. The system **400** may further include one or more second A/V recording and communication devices **403** configured to access the user's network **409** to connect to the network (Internet/PSTN) **410**. The one or more first and second A/V recording and communication devices **402**, **403** may include any or all of the components and/or functionality of the A/V recording and communication device **100** (FIGS. **1-2**), the A/V recording and communication doorbell **130** (FIGS. **3-4**), and/or the A/V recording and communication doorbell **330** (FIGS. **5-7**). As discussed herein, the present disclosure provides numerous examples of methods and systems including the first and the second A/V recording and communication devices **402**, **403**, such as A/V recording and communication doorbells, but the present embodiments are equally applicable for A/V recording and communication devices other than doorbells. For example, the present embodiments may include one or more A/V recording and communication security cameras, one or more A/V recording and communication spotlights, and/or one or more A/V recording and communication security floodlights instead of, or in addition to, one or more A/V recording and communication doorbells. An example A/V recording and communication security camera may include substantially all of the structure and functionality of the doorbell **330**, but without the front button **333** and related components.

The user's network **408**, **409** may include any or all of the components and/or functionality of the user's network **110** described herein. The system **400** may also include one or more client devices **404**, **406**, which in various embodiments may be configured to be in network communication and/or associated with the first A/V recording and communication device **402**. The system **400** may further include one or more client devices **405**, **407**, which in various embodiments may be configured to be in network communication and/or associated with the second A/V recording and communication device **403**. The client devices **404**, **406**, **405**, **407** may comprise, for example, a mobile phone such as a smartphone, or a computing device such as a tablet computer, a laptop computer, a desktop computer, etc. The client devices **404**, **406**, **405**, **407** may include any or all of the components and/or functionality of the client device **114** and/or the client device **800** described herein. In some embodiments, the client devices **404**, **406** may not be associated with the first A/V recording and communication device **402** and the client devices **405**, **407** may not be associated with the second A/V recording and communication device **403**. In other words, the user/owner of the client device(s) **404**, **406**, **405**, **407** may not also use/own an A/V recording and communication device.

The system **400** may further include a first smart-home hub device **411** (which may alternatively be referred to herein as the first hub device **411**) connected to the user's network **408**. The first smart-home hub device **411** (also known as a home automation hub, gateway device, etc.), may comprise any device that facilitates communication with and control of the sensors **414**, automation devices **416**, and/or the one or more first A/V recording and communication devices **402**. For example, the first smart-home hub device **411** may be a component of a home automation system installed at a first property. The system **400** may further include a second smart-home hub device **412** (which may alternatively be referred to herein as the second hub device **412**) connected to the user's network **409**. The second smart-home hub device **412** (also known as a home automation hub, a gateway device, etc.), may comprise any device that facilitates communication with and control of the sensors **418**, automation devices **420**, and/or the one or more second A/V recording and communication devices **403**. For example, the second smart-home hub device **412** may be a component of a home automation system installed at a second property.

Though not shown in FIG. **8**, the first A/V recording and communication device **402** may communicate with the first smart-home hub device **411** directly and/or indirectly via the user's network **408**. As shown in FIG. **8**, the sensors **414** and the automation devices **416** may communicate with the first smart-home hub device **411** directly and/or indirectly via the user's network **408**. Though not shown in FIG. **8**, the second A/V recording and communication device **403** may similarly communicate with the second smart-home hub device **412** directly and/or indirectly via the user's network **409**. As shown in FIG. **8**, the sensors **418** and the automation devices **420** may communicate with the second smart-home hub device **412** directly and/or indirectly via the user's network **409**.

Home automation, or smart home, is building automation for the home. It involves the control and automation of various devices and/or systems, such as lighting, heating (such as smart thermostats), ventilation, air conditioning (HVAC), blinds/shades, and security, as well as home appliances, such as washers/dryers, ovens, or refrigerators/freezers. Wi-Fi is often used for remote monitoring and control. Smart home devices (e.g., the first and the second hub devices **411**, **412**, the sensors **414**, **418**, the automation devices **416**, **420**, the first and the second A/V recording and communication devices **402**, **403**, etc.), when remotely monitored and controlled via the network (Internet/PSTN) **410**, may be considered to be components of the Internet of Things. Smart home systems may include switches and/or sensors (e.g., the sensors **416**, **418**) connected to a central hub such as the first smart-home hub device **411** or the second smart-home hub device **412**, sometimes called a gateway, from which the system may be controlled with a user interface. The user interface may include any or all of a wall-mounted terminal, software installed on the client devices **404**, **405**, **406**, **407** (e.g., a mobile application), a tablet computer or a web interface, often but not always via Internet cloud services. The home automation system may use one or more communication protocols, including either or both of wired and wireless protocols, including but not limited to Wi-Fi, X10, Ethernet, RS-485, 6LoWPAN, Bluetooth LE (BTLE), ZigBee, and Z-Wave.

The one or more sensors **414**, **418** may include, for example, at least one of a door sensor, a window sensor, a contact sensor, a tilt sensor, a temperature sensor, a carbon monoxide sensor, a smoke detector, a light sensor, a glass break sensor, a motion sensor, a thermostat, and/or other sensors that may provide the user/owner of the first security system **422** of a security event at his or her property.

The one or more automation devices **416**, **420** may include, for example, at least one of an outdoor lighting system, an indoor lighting system, and indoor/outdoor lighting system, a temperature control system (e.g., a thermostat), a shade/blind control system, a locking control system (e.g., door lock, window lock, etc.), and/or other automation devices.

As described herein, in some of the present embodiments, some or all of the user's network **408**, the client device **404**, **406**, the first A/V recording and communication device **402**, the first smart-home hub device **411**, the sensors **414**, and the automation devices **416** may be referred to as a first security system **422**, which may be installed at a first property or premises. In addition, in some of the present embodiments, some or all of the user's network **409**, the client device **405**, **407**, the second A/V recording and communication device **403**, the second smart-home hub device **412**, the sensors **418**, and the automation devices **420** may be referred to as a second security system **424**, which may be installed at a second property or premises. The first security system **422** and the second security system **424** may be part of a network of security systems. Although only the first security system **422** and the second security system **424** are included in the illustration of the system **400**, this illustration is not intended to be limiting. In some embodiments, any number of security systems (one or more) may be incorporated into the network of security systems. For example, in an embodiment where the network of security systems includes each of the security systems in a given neighborhood, many of the homes in the neighborhood may have a security system, and as a result, the network of security systems may include the security systems from each of the homes that are part of the network of security systems (e.g., each of the homes that have security systems in the neighborhood that have "opted in" to the network of security systems). In addition, each of the security systems in the network of security systems may have their own security event procedures **499** that may be implemented in response to security events from any other security system in the network of security systems (FIG. **13**). In addition, each of the security systems in the network of security systems may each have different security event procedures **499** in response to each of a variety of different security event data **473**, **491** (FIG. **13**).

With further reference to FIG. **8**, the system **400** may also include various backend devices such as (but not limited to) storage devices **432**, backend servers **430**, and backend APIs **428** that may be in network communication with the first A/V recording and communication device **402**, the second A/V recording and communication device **403**, the first hub device **411**, the second hub device **412**, the client devices **404**, **405**, **406**, **407**, the sensors **414**, **416**, and/or the automation devices **416**, **410**. In some embodiments, the storage devices **432** may be a separate device from the backend servers **430** (as illustrated) or may be an integral component of the backend servers **430**. The storage devices **432** may be similar in structure and/or function to the storage device **116** (FIG. **1**). In addition, in some embodiments, the backend servers **430** and backend APIs **428** may be similar in structure and/or function to the server **118** and the backend API **120** (FIG. **1**), respectively.

FIG. **9** is a functional block diagram illustrating an embodiment of the first A/V recording and communication device **402** according to various aspects of the present disclosure. The first A/V recording and communication device **402** may comprise a processing module **439** that is operatively connected to a camera **434**, a microphone **436**, a speaker **437**, a motion sensor **435**, and a communication module **438**. The processing module **439** may comprise a processor **440**, volatile memory **441**, and non-volatile memory **442** that includes a device application **443**. In various embodiments, the device application **443** may configure the processor **440** to capture image data **448** using the camera **434**, audio data **444** using the microphone **436**, and/or motion data **446** using the camera **434** and/or the motion sensor **435**. In some embodiments, the device application **445** may also configure the processor **440** to generate text data **445** describing the image data **448**, such as in the form of metadata, for example. In some of the present embodiments, the device application **443** may configure the processor **440** to transmit the image data **448**, the audio data **444**, the motion data **446**, and/or the text data **445** to the client device **404**, **406**, the first hub device **411**, and/or the backend server **430** using the communication module **448**.

In various embodiments, the device application **443** may also configure the processor **440** to generate and transmit an output signal **447** that may include the image data **448**, the audio data **444**, the text data **445**, and/or the motion data **446**. In some of the present embodiments, the output signal **447** may be transmitted to the backend server(s) **430** using the communication module **438**, and the backend server(s) **430** may transmit (or forward) the output signal **447** to the client device **404**, **406**, **405**, **407**. In other embodiments, the output signal **447** may be transmitted directly to the client device **404**, **406**.

In further reference to FIG. **9**, the image data **448** may comprise image sensor data such as (but not limited to) exposure values and data regarding pixel values for a particular sized grid. Further, the image data **448** may comprise converted image sensor data for standard image file formats such as (but not limited to) JPEG, JPEG 2000, TIFF, BMP, or PNG. In addition, the image data **448** may also comprise data related to the still image, video, or combination thereof, included in the image data **448**. Such data may include (but is not limited to) image sequences, frame rates, and the like. Moreover, the image data **448** may include data that is analog, digital, compressed, uncompressed, and/or in vector formats.

The image data **448** may include still images, live video, and/or pre-recorded video. The image data **448** may be recorded by the camera **434** in a field of view of the camera **434**. The processor **440** may be configured to transmit the image data **448** (e.g., as live streaming video) to the client devices **404**, **406**, the first hub device **411**, and/or the backend server **430**. The image data **460** may take on various forms and formats as appropriate to the requirements of a specific application in accordance with the present embodiments. As described herein, the term "record" may also be referred to as "capture" as appropriate to the requirements of a specific application in accordance with the present embodiments.

In further reference to FIG. **9**, the motion data **446** may comprise motion sensor data generated in response to motion events. For example, in embodiments using a motion sensor **435**, the motion data **446** may include an amount or level of a data type generated by the motion sensor **435**. In some of the present embodiments, the motion data **446** may also comprise time-based and/or location-based information such as the amount of time a motion event is detected and/or the location of the motion event in the field of view of the motion sensor **435** (e.g., Zones 1-5 (FIG. **6**), the location within one of the Zones 1-5, and/or the proximity to the motion sensor **435**). In other embodiments, dependent on the type of motion sensor **435** implemented in a given embodiment, the motion data **446** may include the data type (e.g., voltage) generated specific to the type of motion sensor **435** (e.g., PIR, microwave, acoustic, etc.). The motion data **446** may further include an estimated speed and/or direction data of the person and/or object that caused the motion event.

In some of the present embodiments, such as those where the first A/V recording and communication device **402** is similar to that of the A/V recording and communication doorbell **130** of FIGS. **3-4**, the motion data **446** may be generated by the camera **434**. In such embodiments, the first A/V recording and communication device **402** may not have a motion sensor **435** (as illustrated by the dashed lines around the motion sensor **435** in FIG. **9**). As such, the detection of a motion event, the determination of whether a motion event is caused by the movement of a person in a field of view of the first A/V recording and communication device **402**, and/or the speed and/or location of a person and/or object in the field of view of the first A/V recording and communication device **402** may be determined using the motion data **446** generated by the camera **434**. In such embodiments, the motion data **446** may include differences between successive frames (e.g., pixels) of the image data **448**, where the differences may be the result of motion in the field of view of the camera **434**, for example.

With further reference to FIG. **9**, in some of the present embodiments, the first A/V recording and communication device **402** may generate a user alert **479**. The user alert **479** may be generated, for example, in response to a motion event in the field of view of the first A/V recording and communication device **402** (e.g., the movement of a person, animal, and/or object). The user alert **479** may be programmed to include information representative of the motion event, such as the motion data **446**, the image data **448**, the audio data **444**, and/or the text data **445** (e.g., for display on the client device **404**, **406** and/or the client devices associated with other A/V recording and communication devices or security systems, such as the client devices **405**, **407**).

FIG. **10** is a functional block diagram illustrating an embodiment of the second A/V recording and communication device **403** according to various aspects of the present disclosure. The second A/V recording and communication device **403** may comprise a processing module **453** that is operatively connected to a camera **463**, a microphone **450**, a speaker **451**, a motion sensor **449**, and a communication module **452**. The processing module **453** may comprise a processor **454**, volatile memory **455**, and non-volatile memory **456** that includes a device application **457**. In various embodiments, the device application **457** may configure the processor **454** to capture image data **462** using the camera **463**, audio data **458** using the microphone **450**, and/or motion data **460** using the camera **463** and/or the motion sensor **449**. In some embodiments, the device application **457** may also configure the processor **454** to generate text data **459** describing the image data **462**, such as in the form of metadata, for example. In some of the present embodiments, the device application **457** may configure the processor **454** to transmit the image data **462**, the audio data **458**, the motion data **460**, and/or the text data **459** to the client device **405**, **407**, the second hub device **412**, and/or the backend server **430** using the communication module **452**.

In various embodiments, the device application **457** may also configure the processor **454** to generate and transmit an output signal **461** that may include the image data **462**, the audio data **458**, the text data **459**, and/or the motion data **460**. In some of the present embodiments, the output signal **461** may be transmitted to the backend server(s) **430** using the communication module **452**, and the backend server(s) **430** may transmit (or forward) the output signal **461** to the client device **404**, **405**, **406**, **407**. In other embodiments, the output signal **461** may be transmitted directly to the client device **405**, **407**.

In further reference to FIG. **10**, the image data **462** may comprise image sensor data such as (but not limited to) exposure values and data regarding pixel values for a particular sized grid. Further, the image data **462** may comprise converted image sensor data for standard image file formats such as (but not limited to) JPEG, JPEG 2000, TIFF, BMP, or PNG. In addition, the image data **462** may also comprise data related to the still image, video, or combination thereof, included in the image data **462**. Such data may include (but is not limited to) image sequences, frame rates, and the like. Moreover, the image data **462** may include data that is analog, digital, compressed, uncompressed, and/or in vector formats.

The image data **462** may include still images, live video, and/or pre-recorded video. The image data **462** may be recorded by the camera **463** in a field of view of the camera **463**. The processor **454** may be configured to transmit the image data **462** (e.g., as live streaming video) to the client devices **405**, **407**, the second hub device **412**, and/or the backend server **430**. The image data **462** may take on various forms and formats as appropriate to the requirements of a specific application in accordance with the present embodiments. As described herein, the term "record" may also be referred to as "capture" as appropriate to the requirements of a specific application in accordance with the present embodiments.

In further reference to FIG. **10**, the motion data **460** may comprise motion sensor data generated in response to motion events. For example, in embodiments using a motion sensor **449**, the motion data **460** may include an amount or level of a data type generated by the motion sensor **449**. In some of the present embodiments, the motion data **460** may also comprise time-based and/or location-based information such as the amount of time a motion event is detected and/or the location of the motion event in the field of view of the motion sensor **449** (e.g., Zones 1-5 (FIG. **6**), the location within one of the Zones 1-5, and/or the proximity to the motion sensor **449**. In other embodiments, dependent on the type of motion sensor **449** implemented in a given embodiment, the motion data **460** may include the data type (e.g., voltage) generated specific to the type of motion sensor **449** (e.g., PIR, microwave, acoustic, etc.). The motion data **460** may further include an estimated speed and/or direction data of the person and/or object that caused the motion event.

In some of the present embodiments, such as those where the second A/V recording and communication device **403** is similar to that of the A/V recording and communication doorbell **130** of FIGS. **3-4**, the motion data **460** may be generated by the camera **463**. In such embodiments, the second A/V recording and communication device **403** may not have a motion sensor **449** (as illustrated by the dashed lines around the motion sensor **449** in FIG. **10**). As such, the detection of a motion event, the determination of whether a motion event is caused by the movement of a person in a field of view of the second A/V recording and communication device **403**, and/or the speed and/or location of a person and/or object in the field of view of the second A/V recording and communication device **403** may be determined using the motion data **460** generated by the camera **463**. In such embodiments, the motion data **460** may include differences between successive frames (e.g., pixels) of the image data **462**, where the differences may be the result of motion in the field of view of the camera **463**, for example.

With further reference to FIG. **10**, in some of the present embodiments, the second A/V recording and communication device **403** may generate a user alert **480**. The user alert **480** may be generated, for example, in response to a motion event in the field of view of the second A/V recording and communication device **403** (e.g., the movement of a person, animal, and/or object). The user alert **480** may be programmed to include information representative of the motion event, such as the motion data **460**, the image data **462**, the audio data **458**, and/or the text data **459** (e.g., for display on the client device **405**, **407** and/or the client devices associated with other A/V recording and communication devices or security systems, such as the client devices **404**, **406**).

FIG. **11** is a functional block diagram illustrating an embodiment of the first smart-home hub device **411** (alternatively referred to herein as the first hub device **411**) according to various aspects of the present disclosure. The first hub device **411** may be, for example, one or more of a Wi-Fi hub, a smart-home hub, a hub of a home security/alarm system, a gateway device, a hub for a legacy security/alarm system (e.g., a hub for connecting a pre-existing security/alarm system to the network (Internet/PSTN) **410** for enabling remote control of the hub device), and/or another similar device. The first hub device **411** may comprise a processing module **468** that is operatively connected to a camera **464**, a microphone **465**, a speaker **466**, and a communication module **467**. In some embodiments, one or more of the camera **464**, the microphone **465**, and the speaker **466** may be omitted from the first hub device **411**. The processing module **468** may comprise a processor **469**, volatile memory **470**, and non-volatile memory **471** that includes a smart-home hub application **472**. In various embodiments, the smart-home hub application **472** may configure the processor **469** to receive sensor data **474** from the sensors **414** and/or the automation devices **416**. For example, the sensor data **474** may include a current state (e.g., opened/closed for door and window sensors, motion detected for motion sensors, living room lights on/off for a lighting automation system, etc.) of each of the sensors **414** and/or the automation devices **416**. In various embodiments, the smart-home hub application **472** may further configure the processor **469** to capture image data **475** using the camera **464** and/or audio data **476** using the microphone **465**. In some embodiments, the smart-home hub application **472** may also configure the processor **469** to generate text data **477** describing the security event data **473**, the occupancy data, and/or the arming status of the security system, such as in the form of metadata, for example. In other embodiments, the text data **477** describing the image data **475** may be generated by a user using the client device **404**, **406** associated with the first hub device **411**.

The smart-home hub application **472** may further configure the processor **469** to generate the user alert **481**. The user alert **481** may include the security event data **473** described herein. The user alert **481** may also, in some embodiments, include information from the user alert **479** received from the first A/V recording and communication device **402**.

In addition, the smart-home hub application **472** may configure the processor **469** to receive the image data **448**, the audio data **444**, the text data **445**, the motion data **446**, and/or the user alert **479** from the first A/V recording and communication device **402** using the communication module **467**. In various embodiments, the smart-home hub application **472** may also configure the processor **469** to generate and transmit an output signal **478** that may include the image data **448**, **475**, the audio data **444**, **476**, the text data **445**, **477**, the motion data **446**, the sensor data **474**, the user alert **479**, **481**, and/or the arming action **479**. In some of the present embodiments, the output signal **478** may be transmitted to the backend server(s) **430** using the communication module **467**, and the backend server **430** may transmit the output signal **478** to the client device **404**, **406** and/or the client device **405**, **407** (e.g., in embodiments where the client device **405**, **407** are associated with a security system in the network of security systems). In other embodiments, the output signal **478** may be transmitted directly to the client device **404**, **406**.

In some of the present embodiments, some or all of the sensor data **474**, the image data **448**, **475**, the motion data **446**, the audio data **444**, **476**, and the text data **445**, **477** may be included in the security event data **473**. The security event data **473** may comprise all of the data generated in response to a security event. For example, if a person breaks into a home, the security event data **473** may include the sensor data **474** generated by the door or window sensors that were breached, the image data **448** generated by the first A/V recording and communication device **402** at the time of the security event, the motion data **466** generated by the motion sensors of the sensor **414** and/or the motion sensor **435** of the first A/V recording and communication device **402**, the audio data **476** recorded by the first hub device **411**, and/or the text data **477** describing the security event based on the sensor data **474**, the image data **448**, the motion data **446**, and/or the audio data **476**.

In some of the present embodiments, the smart-home hub application **472** may configure the processor **469** to generate the arming action **479**. In some embodiments, generating the arming action **479** may include arming/disarming the first security system **422** controlled by the first hub device **411**. For example, the arming action **479** may include a disarmed, an armed stay, armed away, armed vacation, or other armed mode for the first security system **422**. In some of the present embodiments, the first hub device **411** may generate the arming action **479** in response to receiving the arming action **479** over the user's network **408** and/or the network (Internet/PSTN) **410** (e.g., from the backend server **430** and/or the client device **404**, **406**). In some embodiments, the smart-home hub application **472** may configure to the processor **469** to transmit information representative of the arming action **479** to the backend server **430** and/or the client device **404**, **406**. For example, the information representative of the arming action **479** may include the arming status of the first security system **422** (e.g., armed away, armed stay, disarmed, etc.). The smart-home hub application **472** may also configure the processor **469** to monitor the sensors **414**, the automation devices **416**, and/or the first A/V recording and communication device(s) **402** according to the arming action **479**.

The arming actions **479**, as described herein, may include an armed stay, an armed away, an armed vacation, a disarmed mode, and/or other modes, such as a custom mode of the user. In the armed stay mode, the sensors **414** inside the property (e.g., motion sensors) may be disarmed while the sensors **414** and/or the first A/V recording and communication devices **402** outside and along the perimeter of the property (e.g., door sensors, window sensors, security cameras, etc.) may be armed. In addition, during the armed stay mode, at least one of the automation devices **416** (e.g., an outdoor lighting automation system) may be activated between certain hours, such as 6:00 p.m. and 4:00 a.m. In an armed away mode, the sensors **414** inside the property (e.g., the motion sensors), the sensors **414** outside and along the perimeter of the property (e.g., door sensors, window sensors, etc.), and/or the first A/V recording and communication devices **402** (e.g., security cameras, floodlight cameras, etc.) may be armed. In addition, during an armed away mode, one or more of the automation devices **416** (e.g., interior and/or exterior lighting automation systems) may be activated according to an activation schedule (e.g., interior lights on from 5:00 p.m. to 9:00 p.m., exterior lights on from 6:00 p.m. to 8:00 p.m., blinds/shades opened from 12:00 p.m. to 5:00 p.m. and closed from 5:00 p.m. to 4:00 a.m., etc.) in order to provide an indication that somebody is home, even when they are not. In an armed vacation mode, the sensors **414**, the automation devices **416**, and/or the first A/V recording and communication devices **402** may be armed and disarmed similar to the armed away mode, however, any alerts and security events may also be sent to neighbors and/or law enforcement. In a disarmed mode, all of the sensors **414** and/or the automation devices **416** may be deactivated (other than the automation devices **416** in use by the users separate from an arming mode of the first security system **422**). However, in a disarmed mode, the one or more first A/V recording and communication devices **402** (e.g., security cameras, floodlight cameras, video doorbells, etc.) may be in an active state for detecting motion and/or recording activity in the field of view of the one or more first A/V recording and communication devices **402**. In a custom mode, the user/owner of the first security system **422** may configure each of the sensors **414**, the automation devices **416**, and/or the first A/V recording and communication devices **402**. For example, in a custom mode, "Summer," the user/owner may arm each of the door sensors but disable the window sensors (e.g., where windows may be left open for air flow). In addition, the user/owner may activate each of the first A/V recording and communication devices **402** in the back yard to record between 8:00 am and 5:00 p.m. (e.g., because the kids may regularly play in the back yard during the Summer months).

In further reference to FIG. **11**, the sensor data **474** from the sensors **414** and/or the automation devices **416** may include, without limitation, a door open/close status from a door sensor (e.g., located at a front door, a side door, a back door, a door inside the home, etc.), a window open/close status from a window sensor, a garage door open/close status from a tilt sensor, an indoor/outdoor temperature from a thermometer or other temperature sensing device (e.g., thermostat), a carbon monoxide level from a carbon monoxide sensor, a light on/off and/or intensity status from an automated lighting system, a fire alarm status from a fire alarm, motion data from a motion sensor, glass break information from a glass break sensor, a humidity level from a humidity sensor, weather information from a home weather station, lock/unlock status of door/window/garage locks, and/or blinds/shades opened/closed status from a blind/shade automation system. The sensor data **474** may be generated in response to a sensor trigger (e.g., a door opening, a window shutting, etc.), or may be consistently and/or periodically generated to determine a status of the sensors **414** and/or the automation devices **416** and whether or not the status is indicative of a sensor trigger (e.g., a temperature above/below a threshold temperature).

With further reference to FIG. **11**, the sensor data **474** may activate the sensor trigger. The sensor trigger may be an event and/or action that takes place that causes the sensors **414** and/or the automation devices **416** to generate the sensor data **474**. In response to sensor triggers, the sensor data **474** may be generated by the sensor **414** and/or the automation devices **416** representative of the sensor trigger. The sensor data **474** generated in response to the sensor trigger may be analyzed by the first hub device **411** to determine a proper action based on the sensor trigger, such as transmitting the security event data **473** to the backend server **430** and/or the client device **404**, **406**. In addition, the sensor trigger may activate the first hub device **411** to activate or alter the status of the sensors **414** (e.g., by arming the door and window sensors), the automation devices **416** (e.g., by turning on lights of the automated lighting system), and/or the first A/V recording and communication device **402** (and/or other A/V recording and communication devices at the property) (e.g., by activating the camera **434** of the first A/V recording and communication device **402** to record the image data **448**).

In some of the present embodiments, the first hub device **411** may analyze the sensor data **474**, the image data **448**, **475**, the motion data **446**, and/or the audio data **444**, **476** to determine occupancy data for the first property. For example, the sensor data **474** may include motion data from motion sensors of the sensors **414** interior to the property and/or data indicative of a light switch interior to the home being turned on/off within the last 10 seconds, 20 seconds, etc. from a lighting automation system of the automation devices **416**, the image data **448**, **475** may include the presence of person(s) (e.g., based on an analysis using computer vision), the motion data **446** may include an indication of the presence of persons interior to the home (e.g., in embodiments where one of the first A/V recording and communication devices **402** is indoors), and/or the audio data **444**, **476** may include voices, which may provide an indication of the presence of person(s). As a result, the first hub device **411** may analyze the sensor data **474**, the image data **448**, **475**, the motion data **446**, and/or the audio data **444**, **476** to determine the occupancy data. In some of the present embodiments, the occupancy data may be a binary determination, such as occupied and not occupied. In addition, in some embodiments, the occupancy data may also include an estimate of how many people and/or animals are present and/or the location of the people and/or animals at the property (e.g., upstairs, downstairs, in the living room, etc.).

Some non-limiting examples of sensor triggers include, for example, if the sensor **414** is a door or window sensor, the door or window opening or closing. When the door or window is closed, and then is opened, this may be a sensor trigger that results in the door or window sensor generating sensor data **474** representative of the sensor trigger, for example. If the sensor **414** is a smoke detector or other sensor type that activates based on threshold amounts, for example, the sensor trigger may be the threshold amount being reached. For example, the smoke detector may only activate when the smoke levels reach a certain threshold, and when this threshold is reached, the sensor trigger may be said to have occurred, and sensor data **474** may be generated in response. If the sensor **414** is a thermometer, for example, a threshold temperature being reached may be the sensor trigger. In another example, if the sensor **414** is a motion sensor, the sensor trigger may be a threshold amount of detected motion.

In alternative embodiments, the sensor data **474** (including data representative of the sensor trigger) may be received by the first A/V recording and communication device **402** rather than, or in addition to, the first hub device **411**. For example, some environments may not have a smart-home hub device. In these environments, the first A/V recording and communication device **402** may perform at least some of the functions of the first hub device **411** described herein, including receiving, processing, and/or transmitting the sensor data **474**. For example, the sensors **414** and/or the automation devices **416** may be in communication with the first A/V recording and communication device **402**, rather than, or in addition to, the first hub device **411**.

FIG. **12** is a functional block diagram illustrating an embodiment of the second smart-home hub device **412** (alternatively referred to herein as the second hub device **412**) according to various aspects of the present disclosure. The second hub device **412** may be, for example, one or more of a Wi-Fi hub, a smart-home hub, a hub of a home security/alarm system, a gateway device, a hub for a legacy security/alarm system (e.g., a hub for connecting a pre-existing security/alarm system to the network (Internet/PSTN) **410** for enabling remote control of the hub device), and/or another similar device. The second hub device **412** may comprise a processing module **486** that is operatively connected to a camera **482**, a microphone **483**, a speaker **484**, and a communication module **485**. In some embodiments, one or more of the camera **482**, the microphone **483**, and the speaker **484** may be omitted from the second hub device **412**. The processing module **486** may comprise a processor **487**, volatile memory **488**, and non-volatile memory **489** that includes a smart-home hub application **490**. In various embodiments, the smart-home hub application **490** may configure the processor **487** to receive sensor data **492** from the sensors **418** and/or the automation devices **420**. For example, the sensor data **492** may include a current state (e.g., opened/closed for door and window sensors, motion detected for motion sensors, kitchen lights on/off, etc.) of each of the sensors **418** and/or the automation devices **420**. In various embodiments, the smart-home hub application **490** may further configure the processor **487** to capture image data **493** using the camera **482** and/or audio data **494** using the microphone **483**. In some embodiments, the smart-home hub application **490** may also configure the processor **487** to generate text data **495** describing the security event data **491**, occupancy data, and/or the arming status of the security system, such as in the form of metadata, for example. In other embodiments, the text data **495** describing the image data **493** may be generated by a user using the client device **405**, **407** associated with the second hub device **412**.

The smart-home hub application **490** may further configure the processor **487** to generate the user alert **497**. The user alert **497** may include the security event data **491** described herein. The user alert **497** may also, in some embodiments, include the information from the user alert **480** received from the second A/V recording and communication device **403**.

In addition, the smart-home hub application **490** may configure the processor **487** to receive the image data **462**, the audio data **458**, the text data **459**, the motion data **460**, and/or the user alert **480** from the second A/V recording and communication device **403** using the communication module **485**. In various embodiments, the smart-home hub application **490** may also configure the processor **487** to generate and transmit an output signal **496** that may include the image data **462**, **493**, the audio data **458**, **494**, the text data **459**, **495**, the motion data **460**, the sensor data **492**, the user alert **480**, **497**, and/or the arming action **498**. In some of the present embodiments, the output signal **496** may be transmitted to the backend server(s) **430** using the communication module **485**, and the backend server **430** may transmit the output signal **496** to the client device **405**, **407** and/or the client device **404**, **406** (e.g., in embodiments where the client device **404**, **406** are associated with a security system in the network of security systems). In other embodiments, the output signal **496** may be transmitted directly to the client device **405**, **407**.

In some of the present embodiments, some or all of the sensor data **492**, the image data **462**, **493**, the motion data **460**, the audio data **458**, **494**, and the text data **459**, **495** may be included in the security event data **491**. The security event data **491** may comprise all of the data generated in response to a security event. For example, if a person breaks into a home, the security event data **491** may include the sensor data **492** generated by the door or window sensors that were breached, the image data **493** generated by the second A/V recording and communication device **403** at the time of the security event, the motion data **460** generated by the motion sensors of the sensor **418** and/or the motion sensor **449** of the second A/V recording and communication device **403**, the audio data **494** recorded by the second hub device **412**, and/or the text data **495** describing the security event based on the sensor data **492**, the image data **462**, the motion data **460**, and/or the audio data **494**.

In some of the present embodiments, the smart-home hub application **490** may configure the processor **487** to generate the arming action **498**. In some embodiments, generating the arming action **498** may include arming/disarming the first security system **422** controlled by the second hub device **412**. For example, the arming action **498** may include a disarmed, an armed stay, armed away, armed vacation, or other mode for the first security system **422**. In some of the present embodiments, the second hub device **412** may generate the arming action **498** in response to receiving the arming action **498** over the user's network **409** and/or the network (Internet/PSTN) **410** (e.g., from the backend server **430** and/or the client device **405**, **407**). In some embodiments, the smart-home hub application **490** may configure to the processor **487** to transmit information representative of the arming action **498** to the backend server **430** and/or the client device **405**, **407**. For example, the information representative of the arming action **498** may include the arming status of the first security system **422** (e.g., armed away, armed stay, disarmed, etc.). The smart-home hub application **490** may also configure the processor **487** to monitor the sensors **418**, the automation devices **420**, and/or the second A/V recording and communication device(s) **403** according to the arming action **498**.

The arming actions **498**, as described herein, may include an armed stay, an armed away, an armed vacation, a disarmed mode, and/or other modes, such as custom mode of the user. In the armed stay mode, the sensors **418** inside the property (e.g., motion sensors) may be disarmed while the sensors **418** and/or the second A/V recording and communication devices **403** outside and along the perimeter of the property (e.g., door sensors, window sensors, security cameras, etc.) may be armed. In addition, during the armed stay mode, at least one of the automation devices **420** (e.g., an outdoor lighting automation system) may be activated between certain hours, such as 6:00 p.m. and 4:00 a.m. In an armed away mode, the sensors **418** inside the property (e.g., the motion sensors), the sensors **418** outside and along the perimeter of the property (e.g., door sensors, window sensors), and/or the second A/V recording and communication devices **403** (e.g., security cameras, video doorbells, spotlight cameras, etc.) may be armed. In addition, during an armed away mode, one or more of the automation devices **420** (e.g., interior and/or exterior lighting automation systems) may be activated according to an activation schedule (e.g., interior lights on from 5:00 p.m. to 9:00 p.m., exterior lights on from 6:00 p.m. to 8:00 p.m., blinds/shades opened from 12:00 p.m. to 5:00 p.m. and closed from 5:00 p.m. to 4:00 a.m., etc.) in order to provide an indication that somebody is home, even when they are not. In an armed vacation mode, the sensors **418**, the automation devices **420**, and/or the second A/V recording and communication devices **403** may be armed and disarmed similar to the armed away mode, however, any alerts and security events may also be sent to neighbors and/or law enforcement. In a disarmed mode, all of the sensors **418** and/or the automation devices **420** may be deactivated (except for the automation device **420** in use by the user separate from the arming mode of the second security system **424**). However, in a disarmed mode, the one or more second A/V recording and communication devices **403** (e.g., security cameras, floodlight cameras, video doorbells, etc.) may be in an active state for detecting motion and/or recording activity in the field of view of the one or more second A/V recording and communication devices **403**. In a custom mode, the user/owner of the second security system **422** may configure each of the sensors **418**, the automation devices **420**, and/or the second A/V recording and communication devices **403**. For example, in a custom mode, "Keep Cool at Home," the user/owner may arm each of the door sensors and the window sensors. In addition, the user/owner may deactivate each of the motion sensors of the sensors **418** inside of the house (e.g., because the user/owner may be inside the home). In addition, the thermostat of the automation devices **420** may be set to 72 degrees (e.g., to keep cool in the heat) and the blinds/shades automation system of the automation devices **420** may be set to a closed state (e.g., to keep direct sunlight out of the house).

In further reference to FIG. **12**, the sensor data **492** from the sensors **418** and/or the automation devices **420** may include, without limitation, a door open/close status from a door sensor (e.g., located at a front door, a side door, a back door, a door inside the home, etc.), a window open/close status from a window sensor, a garage door open/close status from a tilt sensor, an indoor/outdoor temperature from a thermometer or other temperature sensing device (e.g., thermostat), a carbon monoxide level from a carbon monoxide sensor, a light on/off and/or intensity status from an automated lighting system, a fire alarm status from a fire alarm, motion data from a motion sensor, glass break information from a glass break sensor, a humidity level from a humidity sensor, weather information from a home weather station, lock/unlock status of door/window/garage locks, and/or blinds/shades opened/closed status from a blind/shade automation system. The sensor data **492** may be generated in response to a sensor trigger (e.g., a door opening, a window shutting, etc.), or may be consistently and/or periodically generated to determine a status of the sensors **418** and/or the automation devices **420** and whether or not the status is indicative of a sensor trigger (e.g., a temperature above/below a threshold temperature).

With further reference to FIG. **12**, the sensor trigger may activate the generation of the sensor data **492**. The sensor trigger may be an event and/or action that takes place that causes the sensors **418** and/or the automation devices **420** to generate the sensor data **492**. In response to sensor triggers, the sensor data **492** may be generated by the sensors **418** and/or the automation devices **420** representative of the sensor trigger. The sensor data **492** generated in response to the sensor trigger may be analyzed by the second hub device **412** to determine a proper action based on the sensor trigger, such as transmitting the security event data **491** to the backend server **430** and/or the client device **405**, **407**. In addition, the sensor trigger may activate the second hub device **412** to activate or alter the status of the sensors **418** (e.g., by arming the door and window sensors), the automation devices **420** (e.g., by turning on lights of the automated lighting system), and/or the second A/V recording and communication device **403** (and/or other A/V recording and communication devices at the property) (e.g., by activating the camera **463** of the second A/V recording and communication device **403** to record the image data **462**).

Some non-limiting examples of sensor triggers include, for example, if the sensor **418** is a door or window sensor, the door or window opening or closing. When the door or window is closed, and then is opened, this may be a sensor trigger that results in the door or window sensor generating sensor data **492** representative of the sensor trigger, for example. If the sensor **418** is a smoke detector or other sensor type that activates based on threshold amounts, for example, the sensor trigger may be the threshold amount being reached. For example, the smoke detector may only activate when the smoke levels reach a certain threshold, and when this threshold is reached, the sensor trigger may be said to have occurred, and sensor data **492** may be generated in response. If the sensor **418** is a thermometer, for example, a threshold temperature being reached may be the sensor trigger. In another example, if the sensor **418** is a motion sensor, the sensor trigger may be a threshold amount of detected motion.

In some of the present embodiments, the second hub device **412** may analyze the sensor data **492**, the image data **462**, **493**, the motion data **462**, and/or the audio data **458**, **494** to determine occupancy data for the second property. For example, the sensor data **492** may include motion data from motion sensors of the sensors **418** interior to the property and/or data indicative of a light switch interior to the home being turned on/off within the last 10 seconds, 20 seconds, etc. from a lighting automation system of the automation devices **420**, the image data **462**, **493** may include the presence of person(s) (e.g., based on an analysis using computer vision), the motion data **462** may include an indication of the presence of persons interior to the home (e.g., in embodiments where one of the second A/V recording and communication devices **403** is indoors), and/or the audio data **458**, **494** may include voices, which may provide an indication of the presence of person(s). As a result, the second hub device **412** may analyze the sensor data **492**, the image data **462**, **493**, the motion data **462**, and/or the audio data **458**, **494** to determine the occupancy data. In some of the present embodiments, the occupancy data may be a binary determination, such as occupied and not occupied. In addition, in some embodiments, the occupancy data may also include an estimate of how many people and/or animals are present and/or the location of the people and/or animals at the property (e.g., upstairs, downstairs, in the living room, etc.).

In alternative embodiments, the sensor data **492** (including data representative of the sensor trigger) may be received by the second A/V recording and communication device **403** rather than, or in addition to, the second hub device **412**. For example, some environments may not have a smart-home hub device. In these environments, the second A/V recording and communication device **403** may perform at least some of the functions of the second hub device **412** described herein, including receiving, processing, and/or transmitting the sensor data **492**. For example, the sensors **418** and/or the automation devices **420** may be in communication with the second A/V recording and communication device **403**, rather than, or in addition to, the second hub device **412**.

FIG. **13** is a functional block diagram illustrating one embodiment of the backend server(s) **430** according to various aspects of the present disclosure. The backend server(s) **430** may comprise a processing module **500** including a processor **502**, volatile memory **504**, a network interface **520**, and non-volatile memory **506**. The network interface **520** may allow the backend server(s) **430** to access and communicate with devices connected to the network (Internet/PSTN) **410** (e.g., the first A/V recording and communication device **402**, the second A/V recording and communication device **403**, the first hub device **411**, the second hub device **412**, and/or the client devices **404**, **405**, **406**, **407**). The non-volatile memory **506** may include a server application **508** that configures the processor **502** to receive the security event data **473**, **491**, the user alerts **479**, **481**, **480**, **497**, and/or the arming actions **479**, **498** from the first A/V recording and communication device **402**, the second A/V recording and communication device **403**, the first hub device **411**, the second hub device **412**, and/or the client devices **404**, **405**, **406**, **407** (e.g., in the output signals **447**, **478**, **461**, **496**).

In various embodiments, and as described below, in response to a security event detected by the first security system **422** (e.g., by the first hub device **411**), the processor **502** of the backend server **430** may receive the security event data **473** from the first security system **422**; analyze the security event data **473** to determine a security event procedure **499** for the second security system **424** (e.g., the security system controlled by the second hub device **412**) based on the security event data **473**; when the security event procedure **499** for the second security system **424** includes an automatic arming action (e.g., the arming action **479** that does not require input from a user of the client device **405**, **407**): transmit the automatic arming action to the second security system **424**; when the security event procedure **499** for the second security system **424** includes an arming action request (e.g., the arming action **498** is determined in response to an input from the user of the client device **405**, **407**): generate and transmit, to the client device **405**, **407** associated with the second security system **424** (e.g., the security system controlled by the second hub device **412**), the arming action request; in response to transmitting the arming action request, receive from the client device **405**, **407**, the arming action **498**; and transmit, to the second security system **424** (e.g., the second hub device **412**), the arming action **498**.

In further reference to FIG. **13**, the non-volatile memory **506** may also include source identifying data **510** that may be used to identify the first A/V recording and communication device **402**, the second A/V recording and communication device **403**, the first hub device **411**, the second hub device **412**, and/or the client devices **404**, **405**, **406**, **407**. In addition, the source identifying data **410** may be used by the processor **502** of the backend server **430** to determine the client devices **404**, **405**, **406**, **407** associated with the first A/V recording and communication device **402**, the second A/V recording and communication device **403**, the first hub device **411**, and/or the second hub device **412**. In some of the present embodiments, the source identifying data **510** may be used by the processor **502** of the backend server **430** to determine which other security systems (e.g., smart-home hub devices, client devices, etc.) should be notified when a security event is detected by the first hub device **411** and/or the second hub device **412**.

For example, the security system controlled by the first hub device **411** may be part of a network of security systems, and in response to a security event being detected by the first hub device **411**, the source identifying data **510** may be used to determine which other smart-home hub devices (e.g., the second hub device **412**) are included in the network of security systems that should be notified. This determination may be made based on proximity, in some embodiments. In such embodiments, the location data of the security systems may be used to determine which other smart-home hub devices to notify of the security event. In other embodiments, the determination of which other security systems to notify may be made based on a determination of which security systems have opted-in to the network. For example, a user/owner of a security system may opt-in to receive notifications of security events and/or set a security event procedure **499** for any security events that are detected by any of the security systems in the network(s) of security systems that the security system of the user/owner is included.

In some embodiments, the server application **508** may further configure the processor **502** to generate and transmit a report signal (not shown) to a third-party client device (not shown), which may be associated with a law enforcement agency, for example. The report signal sent to the law enforcement agency may include information indicating an approximate location of where the security event data **473**, **491** was captured, which may assist the law enforcement agency with apprehending the criminal perpetrator from the security event data **473**, **491**.

With further reference to FIG. **13**, the security event procedures **499** may include the processes and determinations that the processor **502** of the backend server **430** makes in response to a security event. The security event procedures **499** may be unique to each of the security systems (e.g., each of the hub devices and associated sensors, automation devices, and A/V recording and communication devices). For example, some of the security systems may have automatic arming actions, as described herein, where the security event procedure **499** includes determining the arming action **479**, **498** based on the security event data **473**, **491**, the occupancy data, and/or the arming status of the security system without requiring input from the user/owner of the security system. In another example, some of the security systems may require arming action requests be made to the user/owner of the security system (e.g., by transmitting a request for the arming action **479**, **498** to a client device associated with the security system), and the arming actions **479**, **498** may be received in response and transmitted to the smart-home hub devices of the security systems.

In addition, the security event procedures **499** may differ for each of the security systems based on the threat level of the security event, the proximity of the security system experiencing the security event to the security system the security event procedure **499** relates to (e.g., the threat level of the security event detected by the first hub device **411** and/or the proximity of the first hub device **411** to the second hub device **412**), and/or the clock data (e.g., the time of day). With reference to FIG. **20**, if a security event is detected by the first hub device **411** located at the first home **728**, the processor **502** of the backend server **430** may analyze the threat level of the security event (e.g., by analyzing the security event data **473**) to determine the security event procedure **499** for the second hub device **412** located at the second home **720**. For example, if the threat level is low, the smart-home hub devices located within the first proximity region **750** may be notified and/or receive an arming action based on the security event procedure **499**, if the threat level is medium, the smart-home hub devices located within the second proximity region **752** (e.g., where the second proximity region **752** encompasses and includes the first proximity region **750**) may be notified and/or receive an arming action based on the security event procedure **499**, and if the threat level is high, the smart-home hub devices located within the third proximity region **754** (e.g., where the third proximity region **754** encompasses and includes the first proximity region **750** and the second proximity region **752**) may be notified and/or receive an arming action based on the security event procedure **499**. As such, in the above example, if the security event is detected by the first hub device **411** located at the first home **728**, and the threat level is determined to be medium or high, the second hub device **412** may be notified and/or receive the arming action **498** based on the security event procedure **499**. In addition, depending on whether the threat level is medium or high, the security event procedure **499** for the second hub device **412** may differ. For example, if the threat level is medium, the security event procedure **499** may include an arming action request be transmitted to the client device **405**, **407** associated with the second hub device **412**. If the threat level is high, the security event procedure **499** may include an automatic arming action for transmitting the arming action **498** to the second hub device **412** without requiring input from the user.

In another example, the proximity of the security systems may be used. For example, with respect to FIG. **20**, the security event procedure **499** for the first security system **422** located at the first home **728** may include to receive notifications (e.g., user alerts **480**, **497**) and/or the arming actions **479** in response to security events detected by security systems within the first proximity region **750**, the second proximity region **752** (which may include the second hub device **412** at the second home **720**), and/or the third proximity region **754** (which may also include the second hub device **412** at the second home **720**). In addition, similar to that described above, the security event procedure **499** may be different for each of the proximity regions (e.g., the first security system **422** may receive notifications only for security events detected by security systems outside of the second proximity region **752** but within the third proximity region **754**, arming action requests for security events detected by security systems outside of the first proximity region **750** but within the second proximity region **752**, and/or automatic arming actions for security events detected by security systems within the first proximity region **750**). In some of the present embodiments, the proximity and the threat level may be used together to determine the security event procedures **499** for each of the security systems.

In some of the present embodiments, in addition to, or in lieu of, the threat level and/or the proximity, clock data may be used by the security systems. For example, with respect to FIG. **20**, the security event procedure **499** for the first security system **422** located at the first home **728** may include to receive notifications (e.g., user alerts **480**, **497**) and/or the arming actions **479** in response to security events detected by security systems within the first proximity region **750**, the second proximity region **752** (which may include the second hub device **412** at the second home **720**), and/or the third proximity region **754** (which may also include the second hub device **412** at the second home **720**) based on the clock data and/or proximity. In addition, similar to that described above, the security event procedure **499** may be different for each of the proximity regions, and within each of the proximity regions may be different dependent on the clock data (e.g., the time of day). For example, the first security system **422** may receive notifications only for security events detected by security systems outside of the second proximity region **752** but within the third proximity region **754**. In such an example, the client device **404**, **406** may receive the notifications in real time if the security event takes place during a predetermined time period (e.g., between 8:00 a.m. and 5:00 p.m.), and may receive the notification at a predetermined time (e.g., 8:00 a.m. for security events occurring after 5:00 p.m.) if the security event occurs outside of the predetermined time period (e.g., if the security event occurs between 5:00 p.m.

and 8:00 a.m.). In another example, the second security system **422** may receive arming action requests for security events detected by security systems outside of the first proximity region **750** but within the second proximity region **752** within a predetermined time period (e.g., 8:00 a.m. to 5:00 p.m.) but may receive automatic arming actions if the security events take place outside of the predetermined time period and/or within another predetermined time period (e.g., 5:00 p.m. to 8:00 a.m.). In such an example, between 8:00 a.m. and 5:00 p.m. the client device **404**, **406** may receive the arming action requests in response to a security event detected by security systems outside of the first proximity region **750** but within the second proximity region **752**. However, between 5:00 p.m. and 8:00 a.m., the first hub device **411** may receive the automatic arming action in response to security events detected by security systems outside of the first proximity region **750** but within the second proximity region **752**. For another example, the first security system **422** may receive automatic arming actions for security events detected by security systems within the first proximity region **750** at any time of day, but a notification may only be sent to the client device **404**, **406** during a predetermined time period (e.g., 8:00 a.m. to 5:00 p.m.). In some of the present embodiments, the proximity, the threat level, and/or the clock data may be used together to determine the security event procedures **499** for each of the security systems.

In some of the present embodiments, the server application **508** may configure the processor **502** of the backend server **430** to determine the occupancy data of the properties where the security systems are located. For example, similar to that described above with respect to the first hub device **411** and the second hub device **412**, the backend server **430** may analyze the security event data **473**, **491** to determine the occupancy data. In some embodiments, the backend server **430** may query the first hub device **411** and/or the second hub device **412** periodically to determine the occupancy data.

In some of the present embodiments, the security event may be verified by the backend server **430** prior to executing the security event procedures **499** for other security systems in the network of security systems. In some embodiments, the security events may be verified if a user of the security system where the security event was detected performs an action(s) in response to receiving a notification (e.g., user alert) of the security event. For example, if the user of the client device **404**, **406** in response to receiving the user alert **479**, **481** from the first security system **422** activates an alarm, alerts law enforcement, contacts a security monitoring service, changes the arming action of the first security system **422** (e.g., by executing the arming action **479**), and/or performs another action, the security event may be determined to be verified. In any embodiment, the security event may be verified by the security monitoring service, such as where the first security system **422** is configured to transmit the security event data **473** to the security monitoring service. In such embodiments, the security monitoring service may review the security event data **473** and verify the security event (e.g., by alerting law enforcement, sounding an alarm, notifying the user/owner of the first security system **422**, providing a verification input, and/or another action). In embodiments where the source (e.g., person, animal, object (e.g., a gun)) of the security event is captured in the image data (e.g., the image data **448**, **475** of the first security system), the image data may be analyzed using facial recognition, facial detection, object detection, object recognition, or other biometric analysis, as described above, to determine if the person, animal, and/or object is a threat. To determine if the person, animal, and/or object is a threat, the person, animal, and/or object may be compared to a database of suspicious person (e.g., a police database), a database of dangerous animals, and/or a database of suspicious objects (e.g., guns and other weapons), respectively, for example. The determination of a threat may provide verification of the security event.

Now referring to FIG. **14**, FIG. **14** is a functional block diagram illustrating one embodiment of a client device **405** according to various aspects of the present disclosure. The client device **405** may comprise a processing module **532** that is operatively connected to an input interface **524**, a microphone **527**, a speaker **528**, and a communication module **530**. The client device **405** may further comprise a camera (not shown) operatively connected to the processing module **532**. The processing module **532** may comprise a processor **534**, volatile memory **536**, and non-volatile memory **538** that includes a client application **540**. In various embodiments, the client application **540** may configure the processor **534** to receive input(s) to the input interface **524** (e.g., inputs of the arming actions **498**). In addition, the client application **540** may configure the processor **534** to transmit the arming actions **498** to the second hub device **412**, the second A/V recording and communication device **403**, and/or the backend server(s) **430** using the communication module **530**. The client application **540** may configure the processor **534** to receive (in some embodiments, via the backend server **430**) the security event data **473**, **491** and/or the arming action requests from the first hub device **411**, the second hub device **412**, the first A/V recording and communication device **402** (e.g., the image data **448** and/or the motion data **446**), and/or the second A/V recording and communication device **403** (e.g., the image data **462** and/or the motion data **460**).

With further reference to FIG. **14**, the input interface **524** may include a display **525**. The display **525** may include a touchscreen, such that the user of the client device **405** can provide inputs directly to the display **525** (e.g., the arming action **498**). In some embodiments, the client device **405** may not include a touchscreen. In such embodiments, the user may provide an input using any input device, such as, without limitation, a mouse, a trackball, a touchpad, a joystick, a pointing stick, a stylus, etc.

In the illustrated embodiment of FIGS. **9-14**, the various components including (but not limited to) the processing modules **439**, **453**, **468**, **486**, **500**, **532** and the communication modules **438**, **452**, **467**, **485**, **530**, and the network interface **520** are represented by separate boxes. The graphical representations depicted in each of FIGS. **9-14** are, however, merely examples, and are not intended to indicate that any of the various components of the first A/V recording and communication device **402**, the second A/V recording and communication device **403**, the first hub device **411**, the second hub device **412**, the client device **405**, and/or the backend server(s) **430** are necessarily physically separate from one another, although in some embodiments they might be. In other embodiments, however, the structure and/or functionality of any or all of the components of each of the first A/V recording and communication device, the second A/V recording and communication device **403**, the first hub device **411**, the second hub device **412**, the backend server **430**, and/or the client device **405** may be combined. As an example, the structure and/or functionality of any or all of the components of the first A/V recording and communication device **402** may be combined. In addition, in some embodiments the communication module **438** may include its own processor, volatile memory, and/or non-volatile memory. As another example, the structure and/or functionality of any or all of the components of the hub device **411** may be combined. In addition, in some embodiments the communication module **467** may include its own processor, volatile memory, and/or non-volatile memory.

Now referring to FIG. **15**, FIG. **15** is a flowchart illustrating a process for arming security systems based on communications among a network of security systems according to various aspects of the present disclosure. The process **1500**, at block B**600**, receives, by a processor using a communication module, a user alert. For example, the processor **534** of the client device **405** using the communication module **530** may receive the user alert **479** generated by the first A/V recording and communication device **402** and/or the user alert **481** generated by the first hub device **411**. In some of the present embodiments, the client device **405** may receive the user alert **479**, **481** from the backend server **430**. For example, the user alert **479** and/or the user alert **481** may be received in response to the backend server **430** analyzing the security event data **473** in response to a security event detected by the first hub device **411** and determining, based on the security event procedures **499** for the second hub device **412**, that the client device **405** associated with the second hub device **412** should receive the user alert **479** and/or the user alert **481** (e.g., based on the proximity of the second hub device **412** to the first hub device **411**, based on the threat level of the security event, based on the clock data, and/or based on the first security system **422** and the second security system **424** belonging to a network of security systems).

The process **1500**, at block B**602**, displays, by the processor on a display, the user alert. For example, the processor **534** of the client device **405** may display the user alert **479** and/or the user alert **481** on the display **525** of the client device **405**. The user alert **479**, **481**, as described above, may include any of the security event data **473** generated by the first hub device **411** and/or the first A/V recording and communication device **402** including the sensor data **474**, the image data **448**, **475** (e.g., video data captured by the camera **434** of the first A/V recording and communication device **402** at the time of the security event), the motion data **446**, the audio data **444**, **476**, and/or the text data **445**, **477**. For example, the user alert **479**, **481** may include a description of the type of security alert detected by the first security system **422** (e.g., the first hub device **411** and/or the first A/V recording and communication device **402**). In addition, the user alert **479**, **481** may include an arming action request (e.g., a request for the arming action **498**). The arming action request may include a list of the arming actions **498** available to the user of the client device **405** (e.g., arm away, arm stay, arm vacation, disarm, etc.).

In addition, in some of the present embodiments, the arming action request may include occupancy data of the second property where the second hub device **412** is located. In such an example, the sensor data **492** from the sensors **418** (e.g., the motion data from motion sensors), the motion data **460** from the second A/V recording and communication device **403**, and/or the audio data **458**, **494** may be used (e.g., by the second hub device **412** and/or the backend server **430**) to determine the occupancy data of the second property where the second security system **424** (e.g., the second hub device **412**) is installed. In some of the present embodiments, the user alert **479**, **481** may also include the arming status of the second security system **424** (e.g., armed away, armed stay, disarmed, etc.). In embodiments where the user alert **479**, **481** includes the occupancy data and/or the arming status of the second security system **424**, the arming action request may include at least one recommended arming action based on the occupancy data of the second property where the second security system **424** is located and/or the arming status of the second security system **424**. For example, if, based on the occupancy data, it is determined that a person is present within the property, the arming action **498** recommendation may include an armed stay mode (or another mode configured for the presence of persons within the property). In another example, if, based on the arming status, it is determined that the second security system **424** is in armed vacation mode, the arming action **498** recommendation may include switching to an armed away mode (which, in some embodiments, may be a more secure setting).

In addition, in some embodiments, the arming action request may include additional arming actions **498** such as activating or adjusting the settings of one or more of the automation devices **420** installed at the second property (e.g., turning on the indoor and/or outdoor lights of a lighting automation system) and/or activating one or more of the A/V recording and communication devices installed at the second property (e.g., activating the second A/V recording and communication device **403** to record the image data **462**, activating other security cameras to record image data, and/or turning on floodlights and/or spotlights of A/V recording and communication devices that include floodlights and/or spotlights).

In some of the present embodiments, the user alert **479**, **481** displayed on the client device **405** may include the video and/or images recorded by the first A/V recording and communication device **402** during the security event. In other embodiments, the user alert **479**, **481** may include live streaming video of the first A/V recording and communication device **402** and/or other A/V recording and communication devices that are part of the first security system **422**. Viewing the video and/or images may help the user of the client device **405** determine if the security event is a threat and/or what actions the user of the client device **405** should take. In other embodiments, the image data **462**, **493** from the second security system **424** may be streamed to the client device **405** along with the user alert **479**, **481**. This way, the user of the client device **405** may view his or her property where the second security system **424** is located to determine if his or her property is safe and secure.

With further reference to FIG. **15**, the process **1500**, at block B**604**, receives, by the processor based on the user alert, an input including an arming action for a second security system. For example, the processor **534** of the client device **405** may receive, based on the user alert **479**, **481**, an input including the arming action **498** for the second security system **424** (e.g., the security system controlled by the second hub device **412**) installed at the second property. The user of the client device **405** may select the arming action **498** for activating the second security system **424**.

The process **1500**, at block B**606**, transmits, by the processor using the communication module, the arming action to the second security system. For example, the processor **534** of the client device **405** using the communication module **530** may transmit the arming action **498** to the second hub device **412** (and/or the second A/V recording and communication device **403**) for arming the second security system **424**. The arming action **498** may be transmitted to the backend server **430**, and the backend server **430** may transmit (or forward) the arming action to the second hub device **412** (and/or the second A/V recording and communication device **403**). In other embodiments, the arming action **498** may be transmitted directly to the second hub device **412** and/or the second A/V recording and communication device **403**.

Now referring to FIG. **16**, FIG. **16** is a flowchart illustrating a process for arming security systems based on communications among a network of security systems according to various aspects of the present disclosure. The process **1600**, at block B**608**, receives, by a processor using a communication module, from a first hub device of a first security system, a user alert including security event data representative of a security event. For example, in response to a security event at the first property including the first security system **422**, the processor **534** of the client device **405**, using the communication module **530**, may receive the user alert **479**, **481** from the first hub device **411** (in some embodiments, via the backend server **430**), where the user alert **479**, **481** may include the security event data **473** representative of the security event.

For example, the security event data **473** included in the user alert **479**, **481** may include the sensor data **474** generated by the sensors **414** and/or the automation devices **418**, the image data **448**, **475** generated by the first A/V recording and communication device **402** and/or the first hub device **411**, the motion data **446** generated by the first A/V recording and communication device **402** and/or a motion sensor of the sensors **414**, the audio data **444**, **476** generated by the first A/V recording and communication device **402** and/or the first hub device **411**, and/or the text data **445**, **477** generated by the A/V recording and communication device, the first hub device **411**, the backend server **430**, and/or a user of the client device **404**, **406** associated with the first security system **422**. The user alert **479**, **481** may display on the display **525** of the client device **405** as a notification, such as a push-notification, for interaction by the user of the client device **405**. For example, the user alert **479**, **481** may display as the text data **445**, **477** describing the security event based on the security event data **473** (e.g., "potential break in at 742 Evergreen Terrace" or "suspicious activity detected at 742 Evergreen Terrace"). For example, in some of the present embodiments, the backend server **430** may receive the security event data **473** from the first A/V recording and communication device **402** and/or the first hub device **411** and analyze the security event data **473** to determine the information to include in the user alert **479**, **481** for transmitting to the client device **405**. The analysis may be based on the security event procedures **499** for the second security system **424** (e.g., the second hub device **412** and/or the second A/V recording and communication device **403**) associated with the client device **405**.

The process **1600**, at block B**610**, receives, by the processor using the communication module, occupancy data. For example, the processor **534** of the client device **405**, using the communication module **534**, may receive the occupancy data pertaining to the second security system **424**. In some embodiments, the client device **405** may receive the occupancy data in response to querying the backend server **430** and/or the second hub device **412**. In other embodiments, the occupancy data may be retrieved by the backend server **430** and transmitted to the client device **405** in response to the security event (e.g., as part of the security event procedures **499**). For example, in such an embodiment, the backend server **430** may receive and/or determine the occupancy data periodically (e.g., without limitation, every 10 seconds, every 30 seconds, every minute, during each check-in by the second hub device **412**, etc.). In any embodiment, the occupancy data may be based on the sensor data **492**, the audio data **448**, **494**, the image data **462**, **493**, and/or the motion data **460**. For example, if the sensors **418** include at least one motion sensor interior to the property where the second hub device **412** (and thus the second security system **424**) is located, the sensor data **492** may include detected motion by the motion sensors which may be indicative of the property being occupied. In another example, the audio data **458**, **494** may be analyzed to determine if voices are heard, which may be indicative of the property being occupied. As another example, the motion data **460** of the second A/V recording and communication device **403** (and/or other A/V recording and communication devices) may be analyzed and, dependent on the location of the second A/V recording and communication device **403** (e.g., inside or outside), the motion data **460** may be indicative of the property being occupied (as mentioned above, in some embodiments, the motion data **460** may be based on the image data **462** generated by the second A/V recording and communication device **403**). For another example, the image data **493** generated by the second hub device **412** (e.g., when the second hub device **412** is located interior to the property), may be analyzed to determine if the property is occupied. In some of the present embodiments, as described above, the occupancy data may be a binary determination, such as occupied and not occupied. In addition, in some embodiments, the occupancy data may also include an estimate of how many people and/or animals are present and/or the location of the people and/or animals at the property (e.g., upstairs, downstairs, in the living room, etc.).

In some of the present embodiments, the occupancy data may be used by the backend server **430** and/or the client device **405** to determine the arming actions **498** to recommend (e.g., the arming action recommendation) for the second security system **424**. For example, as described above, if the occupancy data is indicative of a person(s) being present within the property, the arming actions **498** recommended may include an armed stay mode. For example, the armed stay mode may include the door and window sensors of the sensors **418** being activated and/or the interior motion sensors of the sensors **418** being disabled (e.g., the motion data generated by the motion sensors interior to the property may be ignored). By analyzing the occupancy data to make the arming action recommendations, the arming actions **498** presented to the user of the client device **405** may be more useful (e.g., may avoid unnecessary alarms, such as where an armed away mode is selected while person(s) are present within the home), and also may enable the user to make decisions more quickly (e.g., because the user may not be required to analyze a long list of potential arming actions **498**), thereby securing his or her property sooner.

The process **1600**, at block B**612**, displays, by the processor on a display, an arming action recommendation. For example, the processor **534** of the client device **405** may display the arming action(s) **498** that is recommended on the display **525**. The arming action **498** may be recommended based on the security event procedures **499**, the arming status of the second security system **424**, and/or the occupancy data, as described above. For example, in response to the security event being detected by the first security system **422**, the backend server **430** may analyze the security event procedures **499**, the arming status, and/or the occupancy data of the second security system **424** to determine the arming action recommendation. In response to receiving the arming action recommendation, the client device **405** may display the arming actions **498** that are recommended on the display **525** (e.g., as illustrated in FIG. **21**).

In some of the present embodiments, the backend server **430** may analyze security event data **473** in view of the security event procedures **499** to determine the arming action recommendation and may transmit the arming action recommendation to the client device **405**. In such embodiments, the client device **405** may analyze the occupancy data to determine which of the arming actions **498** received from the backend server **430** should be displayed as the arming action recommendation on the display **525**. In any of the embodiments, as illustrated in FIG. **21**, the arming actions **498** (e.g., the arming action recommendation) may be displayed in addition to the occupancy data **774**, which may aid the user of the client device **405** in making the proper selection of the arming action **498**. In FIG. **21**, because person(s) may be present, the arming action **498** recommended may include an armed stay mode **762**.

The process **1600**, at block B**614**, receives, by the processor, an input including a selection of an arming action for a second security system based on the arming action recommendation. For example, the processor **534** of the client device **405** may receive a selection of the arming action **498** for the second security system **424** based on the arming action recommendation displayed on the display **525**. In some of the present embodiments, because the arming action recommendation may be based on the security event procedures **499** (which may be configured by the user of the second security system **424**), the arming status, and/or the occupancy data, the user of the client device **405** may be more likely to select the arming action **498** based on the arming action recommendation (which may include one or more arming actions **498**).

The process **1600**, at block B**616**, transmits, by the processor using the communication module, to a second hub device of the second security system, the arming action. For example, the processor **534** of the client device **405**, using the communication module **530**, may transmit the arming action **498** selected by the user of the client device **405** to the second hub device **412** of the second security system **424** (in some embodiments, via the backend server **430**). In response to receiving the arming action **498** (e.g., by the second hub device **412** and/or the second A/V recording and communication device **403**), the sensors **418**, the automation devices **420**, and/or the second A/V recording and communication device(s) **403** of the second security system **424** may be armed according to the arming action **498** (e.g., according to the configuration of the second security system **424** for the arming action **498**).

The process **1600** of FIG. **16** may be implemented in a variety of embodiments, including those discussed below. However, the below-detailed embodiments are not intended to be limiting, and are provided merely as example embodiments of the present disclosure. Other embodiments similar to those outlined herein may also fall within the scope of the present disclosure.

With reference to FIGS. **19**-**21**, in an example scenario, a burglar **740** (who may have a weapon **742**) triggers a security event at the property where the first security system **422** is located. In such a scenario, the first security system **422** and the second security system **424** may be part of a network of security systems (e.g., each of the security systems installed on the street **762**, each of the security systems in a neighborhood, each of the security systems in a predetermined proximity to the security system where the security event is detected (e.g., security systems within the first proximity region **750**, the second proximity region **752**, etc.), each of the security systems that are opted into the network, etc.).

In response to the burglar **740** breaking into the first home **728**, the first hub device **411** and/or the first A/V recording and communication device **402** may transmit the user alert **479**, **498** including the security event data **473** representative of the security event triggered by the burglar **740** to the client device **405**. In some of the present embodiments, the backend server **430** may receive the user alert **479**, **481** and analyze the security event data **473** and/or the security event procedures **499** to determine which other security systems (e.g., the second security system **424**) should be notified of the security event. For example, the backend server **430** may determine the network(s) of security systems in which the first security system **422** is included, and which of those security systems in the determined network should receive the user alerts **479**, **481** (e.g., the user of the second security system **424** may desire to receive notification of security events from the first security system **422** but the user of the first security system **422** may not desire to receive notification from the second security system **424**). In addition, in some of the present embodiments, as described above, the backend server **430** may determine a threat level of the security event based on the analysis of the security event data **473**, and based on the threat level, may determine which network(s) of security systems to notify. For example, because the burglar **740** may have the weapon **742** (e.g., as determined using object recognition, or other computer vision, as described above), the threat level may be high. As a result, the third proximity region **754** may be determined to be the network of security systems that should be notified, which may include the second security system **424** located at the second home **720**. By contrast, if the burglar **740** was only loitering on the property (e.g., no perimeter breach was detected and/or no weapon **742** was detected), the threat level may be low, and the determination may be that only the security systems in the first proximity region **750** should be notified, which may not include the second security system **424**.

In some of the present embodiments, the backend server **430** may also analyze the image data, motion data, sensor data, etc. of other security systems in the network of security systems. For example, the backend server **430** may determine other security systems and/or A/V recording and communication devices installed at homes in close proximity to the first security system **422** (e.g., using location data), such as the A/V recording and communication device **725** installed at the third home **730**. For example, the backend server **430** may analyze the image data generated by the A/V recording and communication device **725** to determine if suspicious activity is detected. In an example where the third home **730** also includes a smart-home hub device, the image data, motion data, sensor data, etc. may be analyzed to determine if there is any indication of suspicious activity. In embodiments where it is determined that other security systems and/or A/V recording and communication devices include an indication of suspicious activity, this indication may also be transmitted to the client device **405**. For example, the user alert **479**, **481** may recite, "Potential break in at 742 Evergreen Terrace at 10:30 a.m. and suspicious person detected at 744 Evergreen Terrace at 10:20 a.m." In such an example, computer vision, as described above, may be used to determine if the suspicious person is the same person that broke into the home at 742 Evergreen Terrace, for example. By providing the user of the client device **405** with the information from surrounding homes, the user of the client device **405** may be more likely to view the threat as requiring action because the information may provide an indication that the potential threat may be moving from house to house.

In response to the determination that the user of the second security system **424** should be notified of the security event, the client device **405** may receive the user alert **479**, **481** (at block B**608**). In addition to the user alert **479**, **481**, the client device **405** may receive the occupancy data of the second home **720** from the second security system **424** (e.g., from the backend server **430** and/or the second hub device **412**) (at block B**610**).

In response to receiving the user alert **479**, **481**, and/or the occupancy data, the client device **405** may display the arming action(s) **498** available to the user of the client device **405** for arming the second security system **424** (at block B**612**). The arming action(s) **498** may include recommended arming actions generated by the backend server **430** and received by the backend server **430**, for example. As described above, the arming action recommendation may be based on the occupancy data, the arming status, the security event data **473**, and/or the security event procedures **499** for the second security system **424**. In some of the present embodiments, as described herein, the arming actions **498** may include, in addition to an option to arm the security system (e.g., to an armed stay mode, an armed away mode, etc., using the arming action activation button **762**, for example), the option to activate the automation devices **420** and/or the second A/V recording and communication device(s) **403** (e.g., using the additional activation button **764** in FIG. **21**). In some embodiments, the user may be able select the arming actions **498** and the additional activation of the automation device(s) **420**, and/or the second A/V recording and communication device(s) **403** using the activate all button **766**, for example.

In some of the present embodiments, the display of the arming actions **498** may also include security event information **768** representative of the security event and/or the second security system **424** associated with the client device **405**. The security event information **768** may be based on the security event data **473**, the occupancy data, and/or the arming status of the second security system **424** (e.g., based on the most recent arming action **498** implemented by the second security system **424**). For example, the security event information **768** may include a description of the security event **770**, which may be based on the text data **445**, **477**. In addition, the security event information **768** may include an arming status indicator **772** indicative of the arming status of the second security system **424**. In some embodiments, the security event information **768** may include an occupancy indicator **774**, which may be based on the occupancy data. The security event information **768** may aid the user of the client device **405** in determining the proper arming action **498** to activate for the second security system **424**.

In response to displaying the arming action recommendation and/or the security event information **768**, the user may select, and the client device **405** may receive, the arming action (which may be the arming action **498** from the arming action recommendation) for the second security system **424** (at block B**614**). In response to receiving the selection, the client device **405** may transmit (in some embodiments via the backend server **430**) the arming action **498** to the second hub device **412** and/or the second A/V recording and communication device **403** for arming the second security system **424** (at block B**616**).

In the scenario of FIGS. **19-21**, the user of the client device **405** may activate the armed stay mode, which may include arming the window sensors and the door sensors of the sensors **418**. In addition, the user may activate the second A/V recording and communication device **403** and/or other cameras of the second security system **424** to begin recording. In addition, the user may activate the floodlights, spotlights, and other lights that may be part of the automation devices **420** and/or the second A/V recording and communication device **403** (in embodiments where the second A/V recording and communication devices **403** include a floodlight, a spotlight, etc.). The user may also activate a blinds/shades automation system of the automation devices **420** to close all of the blinds and/or shades that are part of the blinds/shades automation system. In some of the present embodiments, each of the client devices associated with security systems in the network of security systems may receive an arming action recommendation to activate floodlights, spotlights, cameras, etc., such that each of the properties in the neighborhood, street, town, etc. where the network of security systems is located may be illuminated and image data may be recorded. As a result, the burglar **740** may be scared off and/or become more visible to law enforcement, for example. In addition, the burglar **740** may have his or her movements recorded when he or she enters the field of view of any of the cameras, which may aid law enforcement in identifying the burglar **740**.

Now referring to FIG. **17**, FIG. **17** is a flowchart illustrating a process for arming security systems based on communications among a network of security systems according to various aspects of the present disclosure. The process **1700**, at block B**618**, receives security event data from a first security system. For example, in response to a security event detected by the first security system **422**, the processor **502** of the backend server **430** may receive the security event data **473** representative of the security event from the first hub device **411** (and/or the first A/V recording and communication device **402**) of the first security system **422**.

The process **1700**, at block B**620**, analyzes the security event data to determine a security event procedure for a second security system based on the security event data. For example, the processor **502** of the backend server **430** may analyze the security event data **473** to determine the security event procedure for the second security system **424** based on the security event data **473** (and/or the occupancy data of the property where the second security system **424** is located). For example, as described herein, the backend server **430** may determine the security systems that should be notified in response to security events (e.g., based on proximity, based on inclusion in a network of security systems, etc.) and/or in response to certain types of security events (e.g., based on threat level) detected by the first security system **422**. In addition, the backend server **430** may analyze the security event procedures **499** (e.g., the type of notification, the arming action protocol, etc.) for each of the security systems that should be notified, because different security systems may have different security event procedures **499** (e.g., based on the types of sensors, automation devices, and/or A/V recording and communication devices, user preferences, type of security event (e.g., threat level), location of the security event (e.g., proximity), clock data, etc.).

In some of the present embodiments, the security event procedure **499** for some of the security systems may include an automatic arming action. The process **1700**, at block B**622**, determines that the security event procedure is an automatic arming action. When it is determined that the security event procedure **499** is an automatic arming action, the process **1700**, at block B**624**, transmits the automatic arming action to the second security system. For example, the backend server **430** may transmit the arming action **498** to the second security system **424** (e.g., to the second hub device **412** and/or the second A/V recording and communication device **403**). In some of the present embodiments, because the arming action **498** may be transmitted automatically, input from the user/owner of the second security system **424** may not be required. However, in some embodiments, in addition to transmitting the arming action **498** to the second security system **424**, the backend server **430** may transmit a notification (e.g., the user alert **479**, **481**) to the client device **405** associated with the second security system **412** with an indication that the arming action **498** was transmitted to the second security system **424** and allow the user to update/change/add to the arming action **498** (e.g., by activating one or more of the automation devices **420** and/or the second A/V recording and communication device **403** that were not included in the arming action **498**).

In some of the present embodiments, the security event procedure **499** for some of the security systems may include an arming action request. The process **1700**, at block B**626**, determines that the security event procedure is an arming action request. When it is determined that the security event procedure **499** is an arming action request, the process **1700**, at block B**628**, generates and transmits, to a client device associated with the second security system, the arming action request. For example, the processor **502** of the backend server **430** may generate and transmit, using the network interface **520**, the arming action request to the client device **405** associated with the second security system **424**.

The process **1700**, at block B**630**, receives from the client device, an arming action. For example, in response to transmitting the arming action request to the client device **405**, the processor **502** of the backend server **430**, using the network interface **520**, may receive the arming action **498** for the second security system **424** from the client device **405**.

The process **1700**, at block B**632**, transmits, to the second security system, the arming action. For example, after receiving the arming action **498**, the processor **502** of the backend server **430**, using the network interface **520**, may transmit the arming action **498** to the second hub device **412** and/or the second A/V recording and communication device **403** of the second security system **422**.

Now referring to FIG. **18**, FIG. **18** is a flowchart illustrating a process for arming security systems based on communications among a network of security systems according to various aspects of the present disclosure. The process **1800**, at block B**634**, receives security event data from a first security system. For example, the processor **502** of the backend server **430** may receive the security event data **473** from the first security system **422** (e.g., the first hub device **411** and/or the first A/V recording and communication device **402**). This process may be similar to that of block B**618** of the process **1700** of FIG. **17**, described above.

The process **1800**, at block B**636**, analyzes the security event data from the first security system to determine whether the second security system should be notified of the security event. For example, the processor **502** of the backend server **430** may analyze the security event data **473** generated by the first security system **422** to determine whether the second security system **424** should be notified of the security event. For example, as described herein, the security event data **473** may be analyzed to determine each of the security systems that should be notified of the security event. This determination may be made, as described above, by determining the network(s) of security systems in which the first security system **422** is included (e.g., based on the proximity of other security systems to the first security system, based on "opt-in" information, etc.) and/or by determining the threat level of the security event.

The process **1800**, at block B**638**, determines whether the second security system should be notified. If the answer is no, the process **1800** may end. If the determination is yes, the process **1800** may continue to block B**640**.

The process **1800**, at block B**640**, retrieves occupancy data and an arming status from the second security system. For example, the processor **502** may retrieve the occupancy data of the second property where the second security system **424** is located and the arming status of the second security system **424** (e.g., based on the most recent arming action **498** implemented by the second security system **424**). In some of the present embodiments, the occupancy data and/or the arming status may be retrieved from the memory (e.g., the non-volatile memory **506**) of the backend server **430**. In such embodiments, the backend server **430** may be configured to determine and/or store the occupancy data and/or the arming status of the second security system **424**. The occupancy data and/or the arming status may be determined and/or stored periodically, such as every 5 seconds, every 10 seconds, every 30 seconds, every minute, or at each check-in from the second security system **424** (e.g., each check-in from the second hub device **412**). In other embodiments, the backend server **430** may query the second security system **424** for the occupancy data and/or the arming status in response to the security event detected by the first security system **422**.

The process **1800**, at block B**642**, determines a security event procedure for the second security system based on the security event data, the occupancy data, and the arming status. For example, the processor **502** of the backend server **430** may determine the security event procedure **499** for the second security system **424** based on the security event data **473**, the occupancy data, and/or the arming status. For example, the security event data **473** may be used to determine if the security event is a verifiable security event, such as by analyzing the image data **448**, **475** to determine if a suspicious person is present (e.g., using computer vision), by analyzing the sensor data **474** to determine if the perimeter has been breached (e.g., by analyzing the sensor data **474** from the door sensors, the window sensors, and/or the lock sensors), etc. In some of the present embodiments, the security event may be verified based on the actions of the user of the client device **404**, **406** associated with the first security system **422** in response to the security event. For example, if the user activated the first A/V recording and communication device **402**, activated a lighting automation system, sounded an alarm, alerted law enforcement, etc. in response to the security event (e.g., in response to receiving the user alert **479**, **481**), the security event may be determined to be verified and the verification may be stored on the backend server **430**. In another example, if the security event caused a notification to be sent to a security monitoring service that monitors the first security system **422**, the security monitoring service may verify the security event, and the verification may be stored on the backend server **430**. In addition, the security event data **473** may be analyzed to determine a threat level, as described above. In some of the present embodiments, the verification of the security event and/or the threat level may be used to determine the security event procedure **499**. For example, the security event procedure **499** for the second security system **424** may require notification only when a security event is verified and/or only in response to a threshold threat level, as described above.

In addition, the security event procedure **499** may be determined based on the occupancy data of the property where the second security system **424** is located. For example, the security event procedure **499** may include transmitting an arming action request (at block B**648**), where the arming action request may include a recommended arming action. As such, the recommended arming action may be based on the occupancy data, as described above.

In some embodiments, the security event procedure **499** may be based on the arming status. For example, if the second security system **424** is already armed (e.g., armed stay, armed away), the security event procedure **499** may not require any additional action or may only require a notification to be sent to the client device **405** associated with the second security system **424**. In addition, as described above, the security event procedure **499** may include transmitting an arming action request (at block B**648**), where the arming action request may include a recommended arming action. As such, the recommended arming action may be based on the arming status. For example, if the system is already armed, such as armed stay, the recommended arming action may only include additional arming actions, such as activating floodlights, closing blinds/shades, and/or recording using the second A/V recording and communication device **403**.

In some of the present embodiments, the security event procedure **499** for some of the security systems may include an automatic arming action. The process **1800**, at block B**644**, determines that the security event procedure is an automatic arming action. When it is determined that the security event procedure **499** is an automatic arming action, the process **1800**, at block B**646**, transmits the automatic arming action to the second security system. For example, the backend server **430** may transmit the arming action **498** to the second security system **424** (e.g., to the second hub device **412** and/or the second A/V recording and communication device **403**). In some of the present embodiments, because the arming action **498** may be transmitted automatically, input from the user/owner of the second security system **424** may not be required. However, in some embodiments, in addition to transmitting the arming action **498** to the second security system **424**, the backend server **430** may transmit a notification (e.g., the user alert **479**, **481**) to the client device **405** associated with the second security system **412** with an indication that the arming action **498** was transmitted to the second security system **424** and allow the user to update/change/add to the arming action **498** (e.g., by activating one or more of the automation devices **420** and/or the second A/V recording and communication device **403** that were not included in the arming action **498**).

In some of the present embodiments, the security event procedure **499** for some of the security systems may include an arming action request. The process **1800**, at block B**648**, determines that the security event procedure is an arming action request. When it is determined that the security event procedure **499** is an arming action request, the process **1800**, at block B**650**, generates and transmits, to a client device associated with the second security system, the arming action request. For example, the processor **502** of the backend server **430** may generate and transmit, using the network interface **520**, the arming action request to the client device **405** associated with the second security system **424**.

The process **1800**, at block B**652**, receives from the client device, an arming action. For example, in response to transmitting the arming action request to the client device **405**, the processor **502** of the backend server **430**, using the network interface **520**, may receive the arming action **498** for the second security system **424** from the client device **405**.

The process **1800**, at block B**654**, transmits, to the second security system, the arming action. For example, after receiving the arming action **498**, the processor **502** of the backend server **430**, using the network interface **520**, may transmit the arming action **498** to the second hub device **412** and/or the second A/V recording and communication device **403**.

The process **1800** of FIG. **18** may be implemented in a variety of embodiments, including those discussed below. However, the below-detailed embodiments are not intended to be limiting, and are provided merely as example embodiments of the present disclosure. Other embodiments similar to those outlined herein may also fall within the scope of the present disclosure.

With reference to FIGS. **19-21**, in an example scenario, as described above with respect to FIG. **16**, a burglar **740** (who may have a weapon **742**) triggers a security event at the property where the first security system **422** is located. In such a scenario, the first security system **422** and the second security system **424** may be part of a network of security systems (e.g., each of the security systems installed on the street **762**, each of the security systems in a neighborhood, each of the security systems in a predetermined proximity to the security system where the security event is detected (e.g., security systems within the first proximity region **750**, the second proximity region **752**, etc.), each of the security systems that opted into the network of security systems, etc.).

In response to, and during the presence of the burglar **740** at the first home **728**, the first security system **422** may generate the security event data **473**. The first security system **422** may transmit the security event data **473** to the backend server **430** and the backend server **430** may receive the security event data **473** (at block B**634**). In some embodiments, the security event data **473** may also be transmitted by the first hub device **411** to a security monitoring service over the network (Internet/PSTN) **410** (in some embodiments, via the backend server **430**).

The backend server **430** may analyze the security event data **473** to determine if the second security system **424** at the second home **720** should be notified (at block B**636**). For example, the backend server **430** may determine if the first security system **422** and the second security system **424** are included in the same network of security systems **422**. As described above, in some of the present embodiments, the network of security systems may be based on location data (e.g., proximity). For example, it may be determined that each of the security systems within the third proximity region **754** should be notified of security events detected by the first security system **422**. In some of the present embodiments, the network of security systems may be based on, in addition to or in lieu of the location data, opt-in determinations of security systems (e.g., the users/owners of the security systems opting into the network of security systems). For example, the user/owner of the second security system **424** may be able to opt into the network of security systems that may include all of the security systems in the neighborhood, town, and/or city. In such an example, the second security system **424** may not be configured to receive notifications in response to all security events detected by security systems in the network of security systems, but may include an additional layer of filtering, such as proximity and/or clock data, as described above, threat level, as also described above, verification of the security event, as also described above, and/or property type (e.g., only receive notification in response to security events at homes and not at businesses).

Once a determination is made that the second security system **424** should be notified of the security event, the backend server **430** may retrieve the occupancy data and the arming status of the second security system **424** (at block B**640**). The backend server **430** may then determine the security event procedure **499** for the second security system **424** based on the security event data **473**, the occupancy data, and/or the arming status (at block B**642**). If it is determined that the security event procedure **499** for the second security system **424** is an automatic arming action, the backend server **430** may determine, based on the security event data, the occupancy data, and/or the arming status, the arming action **498** (e.g., the arming action recommendation) (at block B**644**). For example, the security event data **473** may indicate that the burglar **740** has broken into the first home **728** and may have a weapon **742**. As a result, the arming action **498** may include arming the second security system **424** to an armed stay or armed away mode (e.g., based on the occupancy data), and also may include closing the blinds/shades using a blinds/shades automation system, activating an outdoor lighting automation system, activating the second A/V recording and communication device **403** to record the image data **462**, and/or sounding an alarm of the second security system **424** (e.g., using a separate speaker, using the speaker **484** of the second hub device **412**, and/or using the speaker **451** of the second A/V recording and communication device **403**). In some of the present embodiments, the arming status may be used to determine which of the sensors **418**, the automation devices **420**, and the second A/V recording and communication devices **403** need to be activated and/or have their status changed based on the arming action **498**. For example, if the outdoor lighting automation system is activated already, the arming action **498** may not include any update to the outdoor lighting automation system. If the second security system **424** is in an armed vacation mode, the arming action **498** may update the second security system **424** to be in an armed away mode, which may be more secure than the armed vacation mode.

In some of the present embodiments, as described above, the backend server may also use the clock data to determine the security event procedure **499** for the second security system **424**. For example, the security event procedure **499** may be an automatic arming action during a first portion of the day (e.g., 11:00 p.m. to 4:00 a.m.), and/or during a certain day of the week (e.g., Saturdays), while the security event procedure **499** may be an arming action request during other portions of the day (e.g., 9:00 a.m. to 4:00 p.m.), and/or during certain days of week (e.g., Mondays, Tuesdays, and Wednesdays). For example, as described herein, the user of the security system **424** may be able to configure the security event procedures **499**. In such examples, the user may set schedules (e.g., hourly schedules, daily schedules, weekly schedules, and so on) as part of the security event procedures **499**, such that the backend server **430** may first determine the time and/or day using the clock data, and then use the time and/or day when analyzing the security event procedure **499** to determine the arming action **498** for the second security system **424**. As described above, in some of the present embodiments, the clock data may be used along with the proximity information and/or the threat level. For example, the based on the proximity and the time of day, the arming action **498** may include different types of alerts. In such an example, if the security event is detected by a security system within two-hundred-fifty yards of the second security system **424**, during daytime hours, the second security system **424** may sound an audible alert and transmit an audible notification to the client device **405**. If the security event is detected by a security system within two-hundred-fifty yards of the second security system **424**, during evening hours, the second security system **424** may sound a silent alert, automatically arm, and the client device **405** may receive a vibration notification. In another example, if the threat level of the security event is high, and the security event occurs during daytime hours, the second security system **424** may sound an audible alert and transmit an audible notification to the client device **405**. If the threat level of the security event is high, and the security event occurs during evening hours, the second security system **424** may sound a silent alert, automatically arm, and the client device **405** may receive a vibration notification.

Once the arming action **498** is determined, the backend server **430** may transmit the arming action **498** to the second security system **424** (at block B**646**).

If it is determined (at block B**648**) that the security event procedure **499** is to generate and transmit an arming action request, the backend server **430** may generate and transmit the arming action request to the client device **405** associated with the second security system **424**. The arming action request, in some of the present embodiments, may include an arming action recommendation, as described herein. The arming action recommendation may be based on the security event data **473**, the occupancy data, and/or the arming status, as described above. In response to transmitting the arming action request, the backend server **430** may receive the arming action **498** from the client device **405** (e.g., after a user of the client device **405** selects the arming action **498**) (at block B**652**). After receiving the arming action **498**, the backend server **430** may transmit the arming action **498** to the second security system **424** (e.g., to the second hub device **412** and/or the second A/V recording and communication device **403**).

Many of the descriptions above of the embodiments of the present processes (e.g., FIGS. **15**-**16**) refer to the client device **405**. It is to be understood, however, that aspects of any method described herein may be performed by any other client device, such as the client devices **404**, **406**, **407**, either alone or in combination with any other of these devices.

In addition, many of the descriptions above of the embodiments of the present processes (e.g., FIGS. **17**-**18**) refer to one of the first hub device **411**, the second hub device **412**, or the backend server **430**. It is to be understood, however, that aspects of any method described herein may be performed by any of these devices, either alone or in combination with any other of these devices.

As a result of the processes described herein, property owners may be made aware of threats to the security of their homes and/or businesses before the threat enters their property. In addition, the property owners may be able to proactively secure their property using their home security systems to prevent the threat from extending onto their property. Ultimately, the safety and security of individual properties, neighborhoods, towns, and cities may be increased thereby contributing to public safety as a whole.

As discussed above, the present disclosure provides numerous examples of methods and systems including A/V recording and communication doorbells, but the present embodiments are equally applicable for A/V recording and communication devices other than doorbells. For example, the present embodiments may include one or more A/V recording and communication security cameras instead of, or in addition to, one or more A/V recording and communication doorbells. An example A/V recording and communication security camera may include substantially all of the structure and functionality of the doorbell **130** (FIG. **3-4**), but without the front button **148**, the button actuator, and/or the light pipe **232**.

FIG. **22** is a functional block diagram of a client device **800** on which the present embodiments may be implemented according to various aspects of the present disclosure. The user's client device **114** described with reference to FIG. **1** may include some or all of the components and/or functionality of the client device **800**. The client device **800** may comprise, for example, a smartphone.

With reference to FIG. **22**, the client device **800** includes a processor **802**, a memory **804**, a user interface **806**, a communication module **808**, and a dataport **810**. These components are communicatively coupled together by an interconnect bus **812**. The processor **802** may include any processor used in smartphones and/or portable computing devices, such as an ARM processor (a processor based on the RISC (reduced instruction set computer) architecture developed by Advanced RISC Machines (ARM).). In some embodiments, the processor **802** may include one or more other processors, such as one or more conventional microprocessors, and/or one or more supplementary co-processors, such as math co-processors.

The memory **804** may include both operating memory, such as random-access memory (RAM), as well as data storage, such as read-only memory (ROM), hard drives, flash memory, or any other suitable memory/storage element. The memory **804** may include removable memory elements, such as a CompactFlash card, a MultiMediaCard (MMC), and/or a Secure Digital (SD) card. In some embodiments, the memory **804** may comprise a combination of magnetic, optical, and/or semiconductor memory, and may include, for example, RAM, ROM, flash drive, and/or a hard disk or drive. The processor **802** and the memory **804** each may be, for example, located entirely within a single device, or may be connected to each other by a communication medium, such as a USB port, a serial port cable, a coaxial cable, an Ethernet-type cable, a telephone line, a radio frequency transceiver, or other similar wireless or wired medium or combination of the foregoing. For example, the processor **802** may be connected to the memory **804** via the dataport **810**.

The user interface **806** may include any user interface or presentation elements suitable for a smartphone and/or a portable computing device, such as a keypad, a display screen, a touchscreen, a microphone, and a speaker. The communication module **808** is configured to handle communication links between the client device **800** and other, external devices or receivers, and to route incoming/outgoing data appropriately. For example, inbound data from the dataport **810** may be routed through the communication module **808** before being directed to the processor **802**, and outbound data from the processor **802** may be routed through the communication module **808** before being directed to the dataport **810**. The communication module **808** may include one or more transceiver modules capable of transmitting and receiving data, and using, for example, one or more protocols and/or technologies, such as GSM, UMTS (3GSM), IS-95 (CDMA one), IS-2000 (CDMA 2000), LTE, FDMA, TDMA, W-CDMA, CDMA, OFDMA, Wi-Fi, WiMAX, or any other protocol and/or technology.

The dataport **810** may be any type of connector used for physically interfacing with a smartphone and/or a portable computing device, such as a mini-USB port or an IPHONE®/IPOD® 30-pin connector or LIGHTNING® connector. In other embodiments, the dataport **810** may include multiple communication channels for simultaneous communication with, for example, other processors, servers, and/or client terminals.

The memory **804** may store instructions for communicating with other systems, such as a computer. The memory **804** may store, for example, a program (e.g., computer program code) adapted to direct the processor **802** in accordance with the present embodiments. The instructions also may include program elements, such as an operating system. While execution of sequences of instructions in the program causes the processor **802** to perform the process steps described herein, hard-wired circuitry may be used in place of, or in combination with, software/firmware instructions for implementation of the processes of the present embodiments. Thus, the present embodiments are not limited to any specific combination of hardware and software.

FIG. **23** is a functional block diagram of a general-purpose computing system on which the present embodiments may be implemented according to various aspects of present disclosure. The computer system **900** may execute at least some of the operations described above. The computer system **900** may be embodied in at least one of a personal computer (also referred to as a desktop computer) **900**A, a portable computer (also referred to as a laptop or notebook computer) **900**B, and/or a server **900**C. A server is a computer program and/or a machine that waits for requests from other machines or software (clients) and responds to them. A server typically processes data. The purpose of a server is to share data and/or hardware and/or software resources among clients. This architecture is called the client-server model. The clients may run on the same computer or may connect to the server over a network. Examples of computing servers include database servers, file servers, mail servers, print servers, web servers, game servers, and application servers. The term server may be construed broadly to include any computerized process that shares a resource to one or more client processes.

The computer system **900** may include at least one processor **910**, memory **920**, at least one storage device **930**, and input/output (I/O) devices **940**. Some or all of the components **910**, **920**, **930**, **940** may be interconnected via a system bus **950**. The processor **910** may be single- or multi-threaded and may have one or more cores. The processor **910** may execute instructions, such as those stored in the memory **920** and/or in the storage device **930**. Information may be received and output using one or more I/O devices **940**.

The memory **920** may store information, and may be a computer-readable medium, such as volatile or non-volatile memory. The storage device(s) **930** may provide storage for the system **900**, and may be a computer-readable medium. In various aspects, the storage device(s) **930** may be a flash memory device, a hard disk device, an optical disk device, a tape device, or any other type of storage device.

The I/O devices **940** may provide input/output operations for the system **900**. The I/O devices **940** may include a keyboard, a pointing device, and/or a microphone. The I/O devices **940** may further include a display unit for displaying graphical user interfaces, a speaker, and/or a printer. External data may be stored in one or more accessible external databases **960**.

The features of the present embodiments described herein may be implemented in digital electronic circuitry, and/or in computer hardware, firmware, software, and/or in combinations thereof. Features of the present embodiments may be implemented in a computer program product tangibly embodied in an information carrier, such as a machine-readable storage device, and/or in a propagated signal, for execution by a programmable processor. Embodiments of the present method steps may be performed by a programmable processor executing a program of instructions to perform functions of the described implementations by operating on input data and generating output.

The features of the present embodiments described herein may be implemented in one or more computer programs that are executable on a programmable system including at least one programmable processor coupled to receive data and/or instructions from, and to transmit data and/or instructions to, a data storage system, at least one input device, and at least one output device. A computer program may include a set of instructions that may be used, directly or indirectly, in a computer to perform a certain activity or bring about a certain result. A computer program may be written in any form of programming language, including compiled or interpreted languages, and it may be deployed in any form, including as a stand-alone program or as a module, component, subroutine, or other unit suitable for use in a computing environment.

Suitable processors for the execution of a program of instructions may include, for example, both general and special purpose processors, and/or the sole processor or one of multiple processors of any kind of computer. Generally, a processor may receive instructions and/or data from a read only memory (ROM), or a random-access memory (RAM), or both. Such a computer may include a processor for executing instructions and one or more memories for storing instructions and/or data.

Generally, a computer may also include, or be operatively coupled to communicate with, one or more mass storage devices for storing data files. Such devices include magnetic disks, such as internal hard disks and/or removable disks, magneto-optical disks, and/or optical disks. Storage devices suitable for tangibly embodying computer program instructions and/or data may include all forms of non-volatile memory, including for example semiconductor memory devices, such as EPROM, EEPROM, and flash memory devices, magnetic disks such as internal hard disks and removable disks, magneto-optical disks, and CD-ROM and DVD-ROM disks. The processor and the memory may be supplemented by, or incorporated in, one or more ASICs (application-specific integrated circuits).

To provide for interaction with a user, the features of the present embodiments may be implemented on a computer having a display device, such as an LCD (liquid crystal display) monitor, for displaying information to the user. The computer may further include a keyboard, a pointing device, such as a mouse or a trackball, and/or a touchscreen by which the user may provide input to the computer.

The features of the present embodiments may be implemented in a computer system that includes a back-end component, such as a data server, and/or that includes a middleware component, such as an application server or an Internet server, and/or that includes a front-end component, such as a client computer having a graphical user interface (GUI) and/or an Internet browser, or any combination of these. The components of the system may be connected by any form or medium of digital data communication, such as a communication network. Examples of communication networks may include, for example, a LAN (local area network), a WAN (wide area network), and/or the computers and networks forming the Internet.

The computer system may include clients and servers. A client and server may be remote from each other and interact through a network, such as those described herein. The relationship of client and server may arise by virtue of computer programs running on the respective computers and having a client-server relationship to each other.

The above description presents the best mode contemplated for carrying out the present embodiments, and of the manner and process of practicing them, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which they pertain to practice these embodiments. The present embodiments are, however, susceptible to modifications and alternate constructions from those discussed above that are fully equivalent. Consequently, the present invention is not limited to the particular embodiments disclosed. On the contrary, the present invention covers all modifications and alternate constructions coming within the spirit and scope of the present disclosure. For example, the steps in the processes described herein need not be performed in the same order as they have been presented, and may be performed in any order(s). Further, steps that have been presented as being performed separately may in alternative embodiments be performed concurrently. Likewise, steps that have been presented as being performed concurrently may in alternative embodiments be performed separately.

What is claimed is:

1. A method for a client device associated with a first security system of a security network, the security network including the first security system installed at a first address and associated to a first user, and a second security system installed at a second address and associated to a second user, the client device including a processor, a communication module, and a display, the method comprising:

in response to a security event detected by the second security system at the second address, receiving, by the processor using the communication module, a user alert including

a description of the security event at the second address when the second address is within a first proximity region with respect to the first address, and

notification of an automatic arming action of the first security system when the second address is within a second proximity region with respect at the first address, the second proximity region being closer to the first address than the first proximity region;

in response to receiving the user alert, displaying, by the processor on the display, the user alert with the description of the security event;

receiving, by the processor based on the user alert, an input including an arming action for the first security system; and

in response to receiving the input, transmitting, by the processor using the communication module, the arming action to the first security system.

2. The method of claim **1**, wherein the user alert is received by a backend device.

3. The method of claim **2**, wherein the backend device is a server.

4. The method of claim **1**, wherein the user alert includes security event data representative of the security event.

5. The method of claim **4**, wherein the security event data includes at least one of motion data generated by a motion sensor of the second security system, image data generated by a camera of the second security system, and sensor data generated by a sensor of the second security system.

6. The method of claim 5, wherein the sensor includes at least one of a door sensor, a window sensor, a flood sensor, a glass break sensor, a contact sensor, a temperature sensor, a smoke detector, a carbon monoxide detector, and a lock/unlock sensor.

7. The method of claim 1, further comprising:
receiving, by the processor using the communication module, an arming action recommendation; and
displaying, by the processor on the display, the arming action recommendation.

8. The method of claim 7, wherein the arming action recommendation includes one of an armed stay mode and an armed away mode based on occupancy data of the first address.

9. The method of claim 1, further comprising:
receiving, by the processor using the communication module, an arming status of the first security system; and
displaying, by the processor on the display, the arming status.

10. The method of claim 1, further comprising:
receiving, by the processor using the communication module, occupancy data of the first address; and
displaying, by the processor on the display, the occupancy data.

11. The method of claim 1, wherein the arming action includes one of activating an armed stay mode, activating an armed away mode, and activating a custom arming mode of the first security system.

12. The method of claim 11, wherein the arming action further includes activating at least one A/V recording and communication device located at the first address to record image data.

13. The method of claim 12, wherein the at least one A/V recording and communication device includes at least one of a video doorbell, an outdoor security camera, an indoor security camera, a floodlight security camera, and a spotlight security camera.

14. The method of claim 11, wherein the arming action further includes activating at least one automation device located at the first address.

15. The method of claim 14, wherein the at least one automation device includes one of an indoor lighting system, an outdoor lighting system, a temperature control system, a shade/blinds control system, and an entertainment system.

16. A client device associated with a first security system of a security network, the security network including the first security system installed at a first address and associated with a first user, and a second security system installed at a second address and associated with a second user, the client device comprising:
at least one processor;
a communication module;
a display; and
a non-transitory machine-readable memory storing a program, the program executable by at least one of the processors, the program comprising sets of instructions for:
in response to a security event detected by the second security system at the second address, receiving, by the processor using the communication module, a user alert including
a description of the security event at the second address when the second address is within a first proximity region with respect to the first address, and notification of an automatic arming action of the first security system when the second address is within a second proximity region with respect at the first address, the second proximity region being closer to the first address than the first proximity region;
in response to receiving the user alert, displaying, by the processor on the display, the user alert with the description of the security event;
receiving, based on the user alert, an input including an arming action for the first security system; and
in response to receiving the input, transmitting, using the communication module, the arming action to the first security system.

17. The client device of claim 16, wherein the user alert is received by a backend device.

18. The client device of claim 17, wherein the backend device is a server.

19. The client device of claim 16, wherein the user alert includes security event data representative of the security event.

20. The client device of claim 19, wherein the security event data includes at least one of motion data generated by a motion sensor of the second security system, image data generated by a camera of the second security system, and sensor data generated by a sensor of the second security system.

21. The client device of claim 20, wherein the sensor includes at least one of a door sensor, a window sensor, a flood sensor, a glass break sensor, a contact sensor, a temperature sensor, a smoke detector, a carbon monoxide detector, and a lock/unlock sensor.

22. The client device of claim 16, wherein the program further comprises sets of instructions for:
receiving, using the communication module, an arming action recommendation; and
displaying, on the display, the arming action recommendation.

23. The client device of claim 22, wherein the arming action recommendation includes one of an armed stay mode and an armed away mode based on occupancy data of the first address.

24. The client device of claim 16, wherein the program further comprises sets of instructions for:
receiving, using the communication module, an arming status of the first security system; and
displaying, on the display, the arming status.

25. The client device of claim 16, wherein the program further comprises sets of instructions for:
receiving, using the communication module, occupancy data of the first address; and
displaying, on the display, the occupancy data.

26. The client device of claim 16, wherein the arming action includes one of activating an armed stay mode, activating an armed away mode, and activating a custom arming mode of the first security system.

27. The client device of claim 26, wherein the arming action further includes activating at least one A/V recording and communication device located at the first address to record image data.

28. The client device of claim 27, wherein the at least one A/V recording and communication device includes at least one of a video doorbell, an outdoor security camera, an indoor security camera, a floodlight security camera, and a spotlight security camera.

29. The client device of claim 26, wherein the arming action further includes activating at least one automation device located at the first address.

30. The client device of claim **29**, wherein the at least one automation device includes one of an indoor lighting system, an outdoor lighting system, a temperature control system, a shade/blinds control system, and an entertainment system.

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